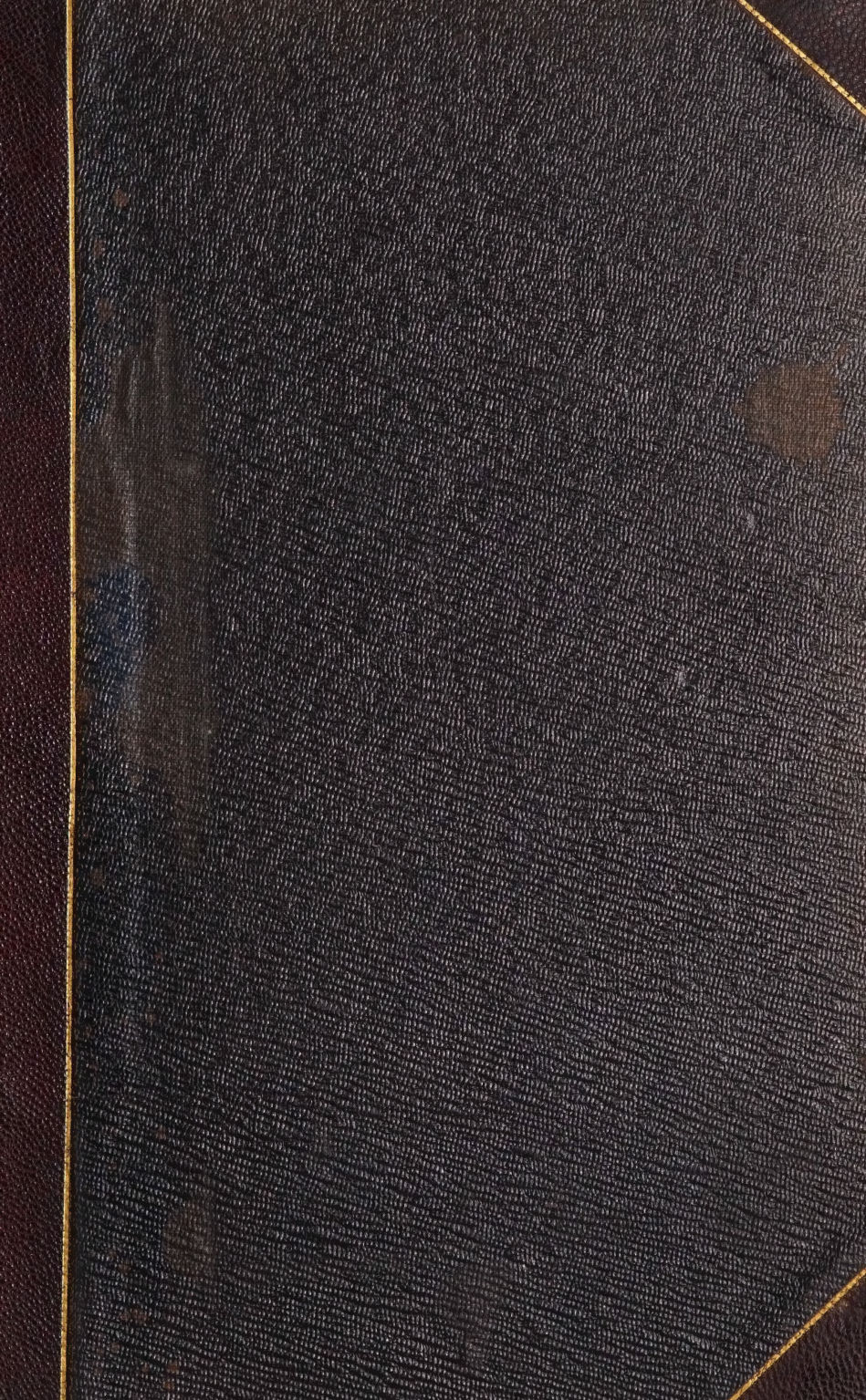
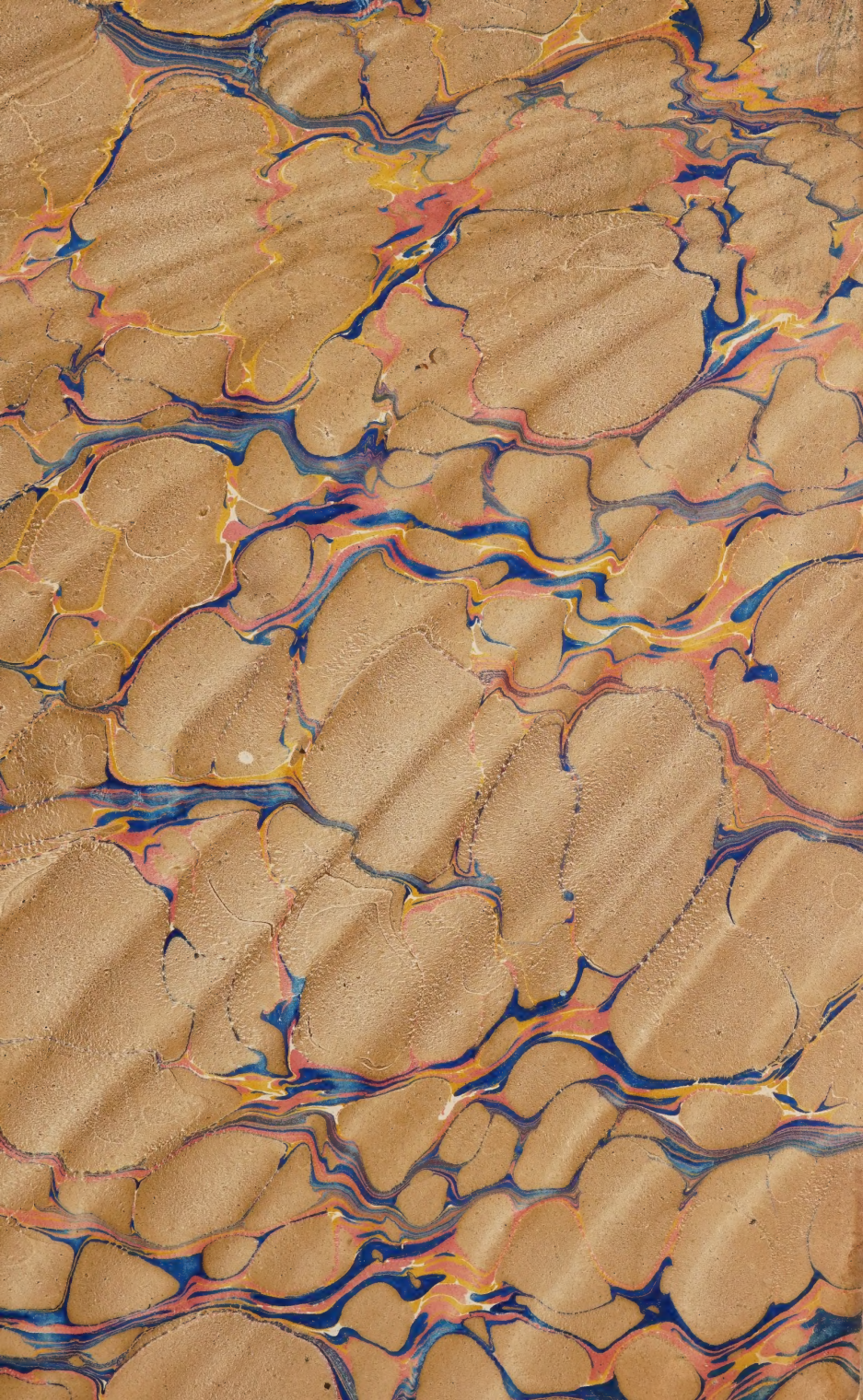










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THE
AMERICAN REPERTORY
OF
ARTS, SCIENCES, AND MANUFACTURES.

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VOL. I.

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THE
AMERICAN REPERTORY

OF ARTS, SCIENCES AND MANUFACTURES.

No. 1.

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VOL. I.

INTRODUCTION.

TIME-honored custom, from whose dictum we see no reasonable cause to dissent, has made it matter of courtesy to say a few preliminary words in explanation of the plan and principles upon which a new periodical work shall be conducted, and of the pretensions which it makes to public encouragement. This has already been done as extensively as was consistent with the brevity of a Prospectus; but the subject is capable of repetition, with a few explanatory details, and to some of the readers of the Repertory it may be altogether new.

The time, we hope, has for ever gone by, when those who were actively engaged as artizans, mechanics, manufacturers, or artists, were contented to obey mere directions, or to follow beaten tracks, in the performance of their avocations, without any curiosity as to the laws by which their several operations were guided, or the principles upon which they were founded. The march of science is now giving fresh improvements to art, and the progress in art affords continual stimulus to science. So rapid is the increase, and so general the desire, for the acquisition of that knowledge which can be turned to a practical account and add new benefits and conveniences to the community, that there is scarcely even a laborer, in town, or field who is so supine as to go through his daily tasks, in their monotonous

onous succession, without a wish to ascertain the grounds and the effect of that on which he is employed.

But if this laudable curiosity be so generally excited among even the least informed of our fellow men, how much more must that ardent desire exist in the minds of those who, in their numerous nice operations and appliances, are compelled to perceive that there are certain fixed laws in nature from which they cannot depart, but which will admit of wonderful modification, at the hands of those who shall have made themselves acquainted with the properties, qualities, and capabilities of matter generally, and particularly of such descriptions of matter as those upon which it is their business to be engaged.

The desire of information which in the course of the last thirty years has received an impulse that is without a parallel in the history of mankind, has been followed up with an energy and a practical benefit in our own country, which has far outstripped that of any other; and the free discussions, the beneficial result of our free institutions, have given vigor to research. The consequence has been, that in all the useful arts, and the sciences connected therewith, we may proudly consider ourselves as not inferior to any people whatsoever. There are, however, certain points of this description, in which aid has not been sufficiently given, and it is the object of this Periodical to supply in some degree the deficiency.

The science of mechanics has scarcely hitherto been possessed of a journal dedicated chiefly to its peculiar interests; whilst on most other subjects, continuous publications are issued containing the new lights thereon from time to time elicited. These publications are prime conductors to improvement, giving experience of the past and leading to the successful future. But the laws of mechanics are of universal application, and the exposition of these, therefore, which seem to have been postponed for all others, ought to have had the earliest consideration. It is impossible to set bounds to conjecture, as to the degree of eminence the mechanic arts might have reached by this time, if the rationale of the application of science thereto had formed a portion of the business in learning a mechanical business heretofore. It is becoming so now, however, and henceforth

the artizan, worthy of the name, will be likewise a geometri-
cian, a chemist, an artist, or a person conversant in literature.
He *may* be all these, he *must* be one or more of them, in order
to hold his standing amongst the more estimable of his brethren ;
for, as the march of knowledge is onward, he cannot afford to
remain in the rear of those who are competing with him in the
race of eminence and the field of emolument.

It is an universal admission that "example is better than
precept ;" accordingly, records of transactions, and descriptions
of discoveries or improvements, more closely attract attention
than the truest of theories given in abstract terms. The latter
however, are essentially necessary, in order to test the correct-
ness and true value of the former. Theories therefore will oc-
cupy a due portion of this work, as containing the bases upon
which useful superstructures should be erected. But, inasmuch
as emulation is chiefly excited by the *acts* of others, and every
known improvement is but the stepping stone to another, it is
believed that the minute and circumstantial details of valuable
patents will be found greatly acceptable to all who shall feel
interested in a work of this kind. It will do justice to the in-
genuity and skill of those who thus distinguish themselves ;
whereas a garbled account, or an extract from a portion of
those details, is calculated to mislead the reader as well as to
fall short in what is due to the author of the patent. In like
manner, reports of the transactions of societies have a most
salutary influence in communicating various minute points of
information which, without them, might fall silently as regards
the public, for an indefinite term.

These are the considerations which stand foremost, in set-
tling the design of the "Repertory ;" there are many others sub-
ordinate thereto, which can as easily be developed in the course
of its procedure before the public, as by any formal descrip-
tion ; but it may nevertheless deserve a passing remark that the
importance of clear illustration will always be kept in view,
and particularly that diagrams, figures, drawings, and their se-
veral marks of reference, will be executed with the most severe
care and clearness that the nature of the press-work can by
possibility permit. This, next to a perspicuous text, is perhaps

one of the greatest helps to a true understanding of mechanical and philosophical subjects, and for the want of proper attention in it nothing can atone.

Original papers and treatises on all subjects connected with the arts, experimental philosophy, and even of abstract literature, will find places in the "Repertory," on fitting occasions. An agreeable variety of subjects tends to keep up the relish for them all, whilst a clogged monotony is calculated to render unpalatable even that which in itself is useful.

Among the original features of the present work it is trusted that one of no small importance will be found in the reports of the conversational meetings of the Mechanics' Institute. It is worthy of remark that we are more apt to treasure up a passing observation of a shrewd nature, or the leading points in a familiar conversation, than those which form parts of a set and formal discourse. We seize upon them as truths uttered unpremeditatedly, and they carry conviction and clear perception as they fall from the speaker, as, at such times each one who ventures on a remark is anxious to give his best experience, and, from practical men, all experience is valuable.

One thing only remains to be touched on here; it is that of punctuality. Nothing has a greater tendency to destroy the desire of information than that of defeated expectation; and it is especially the duty of a careful manager that periodical works appear strictly at their wonted times. The readers therefore of the "Repertory of Arts," may feel assured that, with every care to make the contents worthy of deliberate perusal, the work shall appear duly on the first day of each successive month. With this promise we now address ourselves to duty.

GEOLOGICAL REPORTS.

WE have received during the past and preceding years Geological Reports from several States, including New-York, which we have read with much interest and gratification. As the fourth and last annual report of the survey of New-York will be presented to the legislature by the first of February, 1840, we have prepared a brief notice of those heretofore made

upon this subject, and have also added a reference to similar surveys now in progress, or which are completed, in other states of the Union. As these reports have doubtless been perused by such of our readers as take an interest in these matters, and in the subject of internal improvements generally, we do not think it necessary at this time to go into an examination of the various subjects treated of by the geologists; indeed our present time and space will not allow of more than a bare notice of the reports that have been made thereon. In some future number we may be able to furnish a review or examination of the subjects embraced in these reports, and of the practical results of the geological survey of the state, which are justly considered to be of the highest importance to the arts, to agriculture, and to the cause of science generally.

Some of the states have been already surveyed, viz: Massachusetts, New Jersey, and North Carolina.

The following are now in the progress of survey, viz: New York, Connecticut, Maine, Pennsylvania, Maryland, Virginia, and Michigan.

Partial and preliminary surveys have been made of Ohio, Kentucky, and Indiana.

Geological surveys have been projected or authorized by the legislatures of South Carolina, New Hampshire, and Georgia.

STATE OF NEW-YORK.

THE following extract from a communication by the Governor to the Assembly, February 27, 1839, accompanying the third geological reports, will shew the nature of the survey ordered for this state. "By an act of the Legislature, passed on the 15th of April, 1836, the Governor was authorized and directed to employ a suitable number of competent persons, whose duty it should be, under his direction, to make an accurate and complete geological survey of this state; which survey should be accompanied with proper maps and diagrams, and should furnish a full and scientific description of the rocks, soils, and minerals of the state, and of its botanical and zoological productions, together with specimens of the same. It was further provided, that such maps, diagrams, and specimens,

should be deposited in the state library, and that similar specimens should be deposited in such of the literary institutions of the state as the Secretary of State should direct."

"The act appropriated \$26,000 annually, during four years, to defray the expenses to be incurred, and directed that the person or persons who should be employed should annually make a report to the legislature before the first day of February, setting forth generally their progress in the survey."

By the preceding extract it will be seen that the survey of the state of New York is of a most comprehensive nature, including not only an examination and collection of the rocks, minerals, and soils, but also of the plants and animals of the state, so that the complete reports will present a full account of the natural history of the state of New-York.

The appointments were made by the Governor according to the above resolution; the first annual reports were made to the legislature on the 11th of February, 1837, and form Assembly Document 161, two hundred and twelve pages. We have not time or space here to enter upon an examination of these reports, which are mostly of a general and preliminary character, and have no doubt been perused by most of our readers. These reports were as follows:

Report of *Dr. John Torrey*, on the botanical department of the survey.

Report of *Dr. James E. DeKay* of the zoological department of the survey.

Report of *Dr. Lewis C. Beck*, on the mineralogical and chemical department of the survey. This treats chiefly of the ores of iron, lead, and zinc.

Report of *W. W. Mather*, first geological district, containing general and useful remarks upon economical geology, as coal, lime, iron ores, clay, sand, &c.

Report of *Professor E. Emmons*, second geological district, treating of the topography of this district, and of the ores of copper, lead and iron.

Report of *T. A. Conrad*, third geological district, containing general remarks upon the rocks of this district, and upon salt, plaster, hydraulic limestone, &c.

Report of *Lardner Vanuxem*, fourth geological district, containing general remarks upon the rocks of this district, which underlie the coal measures of Pennsylvania.

The second annual reports were transmitted by the governor to the Assembly on the 20th of February, 1838, and form Assembly Document 200, three hundred and eighty four pages. They consist of—

Letter from *James E. Dekay*, the zoologist, in relation to annual reports from the zoological and botanical departments.

Report of *Dr. Lewis C. Beck*, on the mineralogical and chemical department of the survey. Containing a general and condensed account of the mineral waters of the state, including the Brine Springs of Salina and Montezuma, with a tabular view.

Report of *T. A. Conrad*, on the palæontological [or fossil] department of the survey. The rocks of the state of New-York are arranged in groups, with a list of their characteristic fossils.

Report of *W. W. Mather*, first geological district. Containing the economical geology of Queens, Kings, and Richmond counties, also of Columbia and Dutchess counties, and treating of marl, limestone, marble, and ores of iron, lead, and zinc.

Report of *E. Emmons*, second geological district. Containing examination of the counties of St. Lawrence and Essex—granite, limestone, sandstone, and various ores, heights of mountains, &c. with wood cuts.

Report of *Lardner Vanuxem*, third geological district. Containing economical geology of the counties of Montgomery, Herkimer, Oneida, Oswego, and describing limestones, sandstones, gneiss, &c. with characteristic fossils.

Report of *James Hall*, fourth geological district. Containing geology of the Genesee river, and details of Wayne, Monroe, Orleans, and Niagara counties, treating of limestone, gypsum, sandstone, iron ores, salt springs, &c.

These reports are accompanied by an atlas of maps and lithographic views, illustrating the geology of the third and fourth districts.

The third annual reports were transmitted by the Governor to the Assembly, on the 27th of February 1839, and form As-

sembly Document 275, three hundred and fifty one pages. They consist of—

Report of *Dr. Lewis C. Beck*, on the minerological and chemical department of the survey. Containing tabular view of the minerals of the state, and remarks upon marble, hydraulic or water limestone, gypsum, porcelain clays, ores of iron, manganese, lead, titanium, arsenic.

Report of *T. A. Conrad*, on the palæontological department of the survey. Containing a tabular arrangement of the rocks in groups, with characteristic fossils, and descriptions of new fossils.

Report of *W. W. Mather*, first geological district. Containing economical geology of New-York, Westchester, Putnam, Rockland, and Orange counties, granite, limestone, marble, iron ores, &c. In appendix are report of *W. Horton* upon the county of Orange, and report of *L. D. Gale* upon the county of New York.

Report of *E. Emmons*, second geological district. Containing an account of Hamilton, Clinton, and Warren counties, and treating of porcelain, clay, jasper, peat, black lead, &c.

Report of *Lardner Vanuxem*, third geological district, treating of sandstone, water limestone, gypsum, salt springs.

Report of *James Hall*, fourth geological district, describing the geology of Seneca, Ontario, Yates, Tompkins, and Chemung counties.

Part of the collections made during this survey are arranged in two upper rooms of the capitol at Albany. The rest are in boxes waiting the decision of the legislature as to their final disposition. Eight suites of rocks and minerals have been collected by the geologists.

We cannot enter, in the present number, into an examination of the contents of these reports, or even to present our readers with any extracts. We presume that they have been read with interest by most of our citizens. The subjects are too extensive, and the facts and observations too numerous to allow of anything but a simple reference to them.

In these reports we are presented with full and authentic accounts of all the useful minerals of this state. Quarries of

limestone, marble, and granite, are pointed out and made known; the extensive deposits of plaster and water limestone are fully described; and the numerous and valuable beds of iron ore, lead, &c. are fully and fairly treated of. From these reports we see that Essex and Clinton, in the northern part of the state and Orange and Dutchess counties on the river side, are peculiarly rich in iron ores. A full and interesting account of the salt springs, which are a prominent source of income to the state, is contained in the second report from Dr. Beck. At his suggestion the legislature of 1838 made an appropriation for the purpose of boring for salt water, and for determining whether rock salt exists in the state. This boring was made in 1838, and the results, as stated in Dr. Vanuxem's last report, were, that a depth of 550 feet had been attained, but that the brine was no stronger, and that no rock salt had been met with.

Although no new discoveries of great practical value should be made in the course of this survey, these reports will be valuable in presenting an authentic and connected view of the mineral wealth of the state. From these documents we learn that New-York is especially rich in iron, salt, plaster and marble. Limestone abounds; numerous quarries of granite are pointed out in the counties adjoining the Hudson river, and are declared by Mr. Mather, the geologist of that district, to be of great value and immediately available.

The proper coal-bearing rocks do not appear to occur in this state, and although both anthracite and bituminous coal are found in small seams and cavities at various localities, the quantity is too small to warrant exploration. We hope that these reports will put an end to the fruitless and delusive search for coal; for although black, shining, and glazed slates occur in abundance along the Hudson river, from West Point to beyond Albany, and sometimes greatly resemble coal, yet they uniformly possess a character which is fatal to their use as fuel, namely, they are *incombustible*.

Several mines of lead ore have been opened, and are now wrought in St. Lawrence and Sullivan counties; but the question of their proving profitable or losing concerns is left in an undecided state by the geologists.

Silver mines, so called, have been opened and worked in various parts of the state, at the great cost, and even ruin of the believers in mineral rods, as well as of the ignorant pretenders who use them; the geologists have visited and examined all these places, and find the ore, if there be any, to be nothing but sulphuret of iron, called iron pyrites, which, in such small quantities as are found at these mines, is utterly worthless. Where it appears in extensive beds it is called "copperas ore," and is used for the manufacture of that article.

Copper ores occur in several parts of the state, but not in sufficient abundance to warrant working the mines.

The botany of the state is entrusted to *Dr. John Torrey*, and the zoology to *Dr. James E. Dekay*; and we are satisfied that these subjects will receive full justice at the hands of these gentlemen. Indeed a better selection could not well be made, than that of the persons engaged in this important work.

We have in this notice called the attention of our readers to some of the subjects of economical and practical value contained in these reports, and cheerfully recommend their full perusal to all those who take an interest in the subject of internal improvement, and the developement of the resources of the state. Much scientific matter is also presented in connection with these general subjects, such as the age of the New-York rocks, their continuity with those of other states, and their identity with the rocks of the other continent; but as the scientific matter is intended for the final report, and will be contained therein, we shall not refer to these subjects at the present time. We anticipate with much interest the fourth and final reports, and hope to be able upon their appearance to present an extended notice of their contents.

In our next we shall proceed to notice the reports which have been received, concerning the other states mentioned at the head of this article.

(TO BE CONTINUED.)

[For the American Repertory]

On the magneto-electric spark and shock, and electro magnetic rotations. By W. H. GOODE, Chemical Assistant in the laboratory of the University of the City of New-York.

THE ordinary method of exhibiting the reactions of electricity and magnetism, is to cause the armature of an electro-magnet, wrapped with insulated copper wire, to rotate before the poles of the magnet, and to interrupt the circuit formed in this wire at the moment the polarity of the armature is reversed. A spark is seen, a shock can be received and decompositions can be effected at the point of disjunction. As comparatively little interest is manifested towards the study of these phenomena, few institutions are provided with the apparatus necessary to a full experimental illustration of the laws which they obey. Recent experiments, conducted with a view of employing electro magnetism as a motive power, are bringing it and its kindred branches of science more into notice. It may not therefore be useless to state some methods more simple than those in common use, of exhibiting the most striking experiments connected with these subjects; and to give some reasons for the hitherto unsuccessful application of electro-magnetism to the movement of machines.

A silk-covered copper wire $\frac{1}{2}$ th or $\frac{1}{6}$ th of an inch in diameter, and thirty feet in length, should be formed into a helix, capable of admitting into its axis a cylinder of soft iron, one inch in diameter. On connecting the helix with a single voltaic pair, exposing a square foot of surface, no spark will be observed when contact is made, and a feeble one when it is broken. If the cylinder of soft iron be inserted into the helix, a brilliant spark, accompanied by an audible snap, will be perceived at the moment of breaking contact. Shocks will be received if the ends of the helix be grasped with wet fingers and contact be broken. They are more violent if two metallic cylinders, which when grasped are in contact with a large surface of the wet hands, and adjusted to the helix near its ends, or dip into the cups of mercury which connect it with the battery.

Decompositions can also be effected, by replacing the handles with wires suitable for that purpose.

Where silk-covered wire cannot be procured, it may be dispensed with, by separating the convolutions of the helix so that they shall not touch each other; the pasteboard or wooden tube on which it is usually formed is also rendered needless, by winding the wire on the cylinder of soft iron previously coated with sealingwax.

To procure very striking results, it is only necessary to enlarge certain parts of the apparatus; the others at the same time admit of being diminished in their dimensions. Professor Jacobi [Scientific Memoirs, Part 4, pp. 350] obtained a brilliant spark, and received a violent shock, from an arrangement consisting of an electro-motor of one pair of plates, exposing half a square inch of surface, and a helix formed of 400 feet of coated wire about $\frac{1}{8}$ th of an inch in diameter, which admitted into its axis a bar of soft iron $1\frac{1}{2}$ inches in diameter. On grasping the handles of this apparatus with wet hands, and breaking contact, the shock was so severe that it could scarcely be borne. By employing an electro motor, of a single pair of plates, exposing about two square feet of surface, and a helix formed of six feet of insulated copper wire $\frac{1}{16}$ th of an inch in diameter, which admitted into its axis a rod of soft iron $\frac{1}{4}$ of an inch in diameter, I have obtained a brilliant spark, and a shock through one hand.

An experimenter, therefore, can consult his convenience as far as regards the dimensions of the parts of his apparatus. A pair of plates exposing a large surface can be employed in connection with a small helix made of a short wire; or the surface of the pair may be diminished, and the diameter of the helix and that of the soft iron enlarged, and the wire lengthened. Professor Faraday has given a method of procuring the magnetic spark, which dispenses with the use of the voltaic pair and the temporary magnet. On the end of a pasteboard tube a cylindrical magnet could freely move through which twenty feet of silked wire wrapped, forming a ring helix. A small amalgamated copper plate was fastened to one of its ends, the other being bent so as to pass the end of the tube, and touch this

plate perpendicularly on its flat surface. The spark was perceived at the point of disjunction, whenever the magnet was pushed quickly through the tube and separated the end of the wire from the surface of the plate. A piece of wood should be attached to the end of the magnet, that the wire, and the plate may be separated at the moment it is passing through the helix, that being the most favorable condition of the apparatus.

Magneto-electricity is generated when a piece of soft iron becomes a magnet, and when it parts with its magnetic property. These currents are momentary, being mere waves of electricity which pass in opposite directions. The rotations of a magnet in the vicinity of a conducting wire produce, in that wire a continuous current, of high intensity, which varies in quantity with the velocity of rotation. These two facts are the main obstacles to the profitable application of electro-magnetism as a motive power. A magnet or system of magnets actuated by a voltaic current, of a certain quantity, gives rise to a current flowing in the opposite direction to that of the motor, and consequently diminishes its effect. Increasing the dimensions of the voltaic pair produces no permanent acceleration of the velocity of the rotating system; for the same means employed to increase the velocity, in the same ratio adds to the quantity of the opposing current. These results have been obtained by professor Jacobi, [Scientific Memoirs, Part 4, pp. 528-531,] who measured with a galvanometer, the current circulating through his electro-magnetic machine, both before and after its motions were allowed to commence. In the former case, it was nearly one fourth greater than in the latter; the quantity of the magneto-electric current was therefore equal to nearly one fourth of that generated by the plates. Increasing the velocity of rotation, by mechanical means, was found still further to diminish the amount of electricity circulated by the battery.

Although the magneto-electric current possesses an intensity which under favorable circumstances enables it to decompose water, it cannot pass through a thick stratum of that fluid. By employing a motor battery, consisting of a number of alternations of pairs of plates, the length of the interposed liquid con-

ductor hinders the passage of opposing currents, but allows the full effect of the voltaic current to be obtained. With a battery consisting of twelve alternations, a force equal to half that of a man can be exerted; more recently a battery, one of whose elements was twenty square feet of platina, propelled a boat on the Neva. *L. & E. Phil. Mag. for Oct. 1839.*

These experiments only show the difficulties to be overcome before electro-magnetism can be successfully and profitably applied to mechanical purposes. The immense force generated by the solution of a few grains of zinc has only served to exemplify the laws obeyed by an imponderable agent, a correct knowledge of which may yet enable the mechanist to govern its effects at will.

University of the City of New-York, Dec. 11th, 1839.

[For the American Repertory.]

THE ART OF BUILDING.

BY JAMES FROST.

No. I.

THE present age may be clearly and honorably distinguished above all others, by the great improvements effected in many of the useful arts, and for its advancement in science. But among those brilliant achievements, may it not be questioned whether that art, so essential to the comfort, security and well-being of mankind—the art of building—has advanced in as great degree as many others; and whether it is not susceptible of great and immediate improvement?

As the promotion of the useful arts is to be a prominent object in your forthcoming work, I am induced to submit to you this first of a short series of essays, or proposed improvements, in the art of building; many important branches of which are at present greatly behind the state in which they ought to be.

A very curious and wide distinction may be drawn between the motive principles of architects and of civil engineers; the

one class being ever stationary, copying, depending on, and imitating what has already been done in their art; the other always progressive, enquiring, and endeavoring at improvement. In consequence of these different motives, we compose better copies of Grecian temples and other structures, than our ancestors; but do these copies satisfy the real wants of the present age, or correspond with the general advancement in art? Something better than mere copies from any age seems to be in continual requisition, and we ought to be in advance of all previous ages.

We have a case in point, in that mighty instrument, of modern improvement, the steam engine; the most ancient of which on record we derive from the Greeks in the engine of Ctesibes, which some persons have not hesitated to introduce and to recommend to public notice; yet how puerile, how contemptible is it, when placed in comparison with those of modern invention! Can it then be unfair to inquire, why our *builders* may not as far surpass those of the ancient as our *engineers* have so successfully done? and may not great improvements be anticipated from the assistance which builders may derive from engineers, and from that almost creative class—the modern chemists?

The continual destruction of buildings by fire, the immense loss thereby of property, and frequently of life, by the most horrible of deaths, the consequent continual anxiety, suffering, terror, and frequent destitution of large portions of the community, indubitably prove that the practical art of constructing secure buildings has not yet been attained; while the want of such art, being a great private as well as national loss, is positively disgraceful to the age.

The progress to a better and sounder system has doubtless been delayed by a reliance on fallacious and inadequate means of security; and the many attempts to palliate these evils, instead of at once boldly attempting a radical cure of them, have proved, when tested, unsatisfactory and delusive. Of this we have had frequent instances in the combustion of buildings termed *par excellence*, *fire proof*; the carcases of which on examination have been generally found the most combustible in existence.

That we possess unfailing remedies for these evils is undeniable, provided we have the prudence to anticipate them ; the skill to select the enduring mineral substances, so abundantly furnished by Providence for these important purposes ; and the industry and perseverance to apply them to use.

Now it is the purpose of this essay to show that the judicious application of these neglected beneficent productions will in all cases be highly efficient, and that generally they will be more advantageous than the employment of vegetable materials, so much used and abused ; the latter being the efficient and sole causes of the grievous misery and sudden destitution so afflicting to the present generation, and, by greatly delaying the improvement of the country, through the misapplication and unnecessary destruction of capital, impoverishing even future generations.

In building it should ever be borne in mind that timber, so destructible by fire, is also from many natural causes subject to early and certain decay, within a period in which sound mineral buildings will endure, free from the slightest deterioration ; and hence, when, as we often see, no expense is spared on *exteriors* of marble or granite of the most elaborate workmanship, the *interiors* of such enduring and splendid structures are formed of wood—the true emblem of decay and of conflagration—what melancholy reflections arise from these contradictions, so discreditable to the age.

The construction of combustible or incombustible buildings affects not individuals only, but cities and nations in no trivial degree, with weakness, dependence, insecurity, and disgrace ; or with strength, independence, security, and honor. What weak points are combustible cities in war ! how incapable of defence ! how open to insult and aggression, inviting to the attack of steam or rocket batteries !—how secure, how invulnerable would incombustible cities be in similar circumstances, how free from apprehension, how proud the inhabitants !

Great and desirable as are these advantages, mineral buildings will yet secure others, second only, if at all inferior, to the preceding.

We desire the protection of buildings, not only from the rava-

ges of fire, but also from the ever varying vicissitudes of the seasons ; we constantly need a genial temperature in our dwellings, in order to preserve serenity of mind, bodily comfort, continuance of life, and health ; all of which blessings are miserably hazarded or dearly purchased in slight and insufficient buildings ; and, that life itself is fearfully sacrificed in them, is fatally evidenced in the extensive prevalence of consumption.

That dwellings may be constructed that will maintain a more equal temperature, free from the train of annoyances now experienced, and consistent with ease and true economy, will be hereafter apparent.

That incombustible buildings were known and highly valued by ancient civilized nations is proved in the numerous splendid remains ; evidences alike of the preference in the choice of materials, and of proficiency in their construction, which as yet are unattained by modern artists, and are not attainable without great energy of pursuit, and study of the inherent qualities of matter for building purposes. Be it observed that many of those structures of surpassing beauty were the works of what is now considered an unenlightened age ; how justly, let the comparison between modern and ancient buildings prove. Be it observed also, that these were produced, when the surrounding countries abounded with wood ; and mineral substances were used only from a strong conviction of their intrinsic superior good qualities ; in short from true economy.

That incombustible buildings are highly valued by the present generation is sufficiently shewn by the erection of two splendid buildings, at unlimited cost, now in great forwardness, in the city—I allude to the Merchants' Exchange and the Custom House, each on somewhat different principles from the other, as will be shown hereafter, and as might be expected from the hands of different artists ; each work, however, destined to be an honor and ornament to the city for many generations.

Without discussing their ornamental parts, but attending to their useful qualities only, they possess decided intrinsic advantages over all other buildings, in their strength, durability, incombustible property, and in the equalized temperature which their massive masonry will secure throughout ; the last named

object being at once the cause of, and excuse for, the employment of so much more material than is generally used in modern structures.

But it must be evident that such styles of building, however useful or imposing in public works, can never be suitable for, or adopted in private edifices; in which the value of the immense space occupied by ponderous groined arches, and of the massive walls and buttresses required to sustain and to abut those heavy arches, and the value of the immense accumulation of materials, must ever prevent the erection of private works upon entirely the same principles.

Now, as it must be desirable to discover a mode of building, embracing and possessing every good and useful quality which is contained in those public buildings, and if possible in greater perfection, without any unnecessary sacrifice of space or extravagant outlay of money, by quitting a royal for a republican method, and to extend those advantages to the many that are now hardly accessible to the few; and as these objects seem to me easily attainable by the application of some hitherto unpublished facts and principles, deduced from long reflection and experience, I shall in a future paper, endeavor to show how buildings may be economically constructed so as to be insusceptible of speedy decay, or of combustion; more impervious to heat or to cold, to smell or to sound; free from many minor annoyances, and altogether better adapted than those at present in use, to increase the comfort, security and prosperity of mankind.

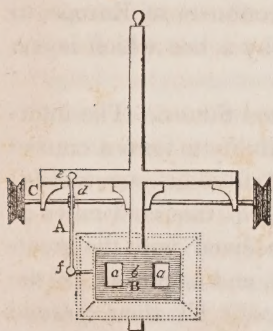
January 1st, 1840.

IMPROVED RUNNING GAUGE, *for ascertaining if the width between the rails of a railway be in gauge.*

THE railway gauge invented by Mr. COWPER, and now in general use, has an index, acted upon by a hand communicating with a part corresponding in its movements to the sliding shaft, *c*, represented in the drawing; it is therefore necessary for a man to watch its movements, and mark such parts of the

road, by throwing shells or white sand upon the affected parts, as require adjustment.

The drawing represents an improvement suggested by W. I. Hindle, Esq. of Barnsley, which would be entirely self-acting. It is communicated in the *Civil Engineers' and Architects' Journal*, for September 1839, p. 338. This machine would mark the parts of the road out of guage, even if it were attached to a locomotive, traveling at its greatest speed.



By the arrangement of the lever *a*, having its fulcrum at *e*, and the sliding axle *C*, running through the lever at *d*, having collars fitting exactly to the sides of the lever, the axle could turn freely, whilst the least motion in the direction of the axis would be communicated to the lever.

To the end *f*, of the lever, should be attached a moveable slide *B*, having two slits, *a a*, in it, and moving close under the bottom of a box or hopper indicated by the dotted lines; this box should be filled with powdered chalk, or white sand, having an opening in the bottom exactly corresponding with the solid part, *b*, of the slide *B*. When the machine is running upon rails of true guage, the solid part, *b*, of the slide will be under the opening in the bottom of the box, and prevent the escape of the material within; but on coming to a different width of rails, one or other of the openings in the slide will be brought under the opening in the bottom of the box, and allow a greater or less quantity of the material in the box to escape, according as the width of the rails is greater or less than the true guage.

RAILROADS.

F. A CHEVALIER DE GERSTNER, of Cincinnati, published, lately, a comparison between the railroads of the Kingdom of Belgium and those of the United States. This paper, embracing as it does a large mass of tabular and statistical matter re-

lating to the railroads of the two countries, is too voluminous to be published entire in the Repertory, except to the exclusion of much that might claim an equal interest with it ; there are, however, some deductions drawn by M. De Gerstner from his data, extremely valuable to all engaged in such works, or in matters intimately connected therewith. The writer of the report was for many years engaged in the construction of railroads in Europe, indeed from the commencement, for he remarks, "in 1824 I had charge of the first railroad on the continent of Europe, to connect the rivers Moldau and Danube, by a line which is one hundred and thirty miles long."

In November 1838, he visited the United States. The interest he feels in our public works and his ability to form a correct estimate of them, again may be gathered from his own words : "I have already passed over more than two thousand miles of railroads, and have every where been received with the greatest kindness. The presidents, directors, and engineers, of the different railroad lines gave me not only all their printed reports, but laid before me, with the greatest liberality, their books and accounts, in order to give me every kind of information."

The comparison above referred to was published by M. De Gerstner, with a view to make some return for the kindness and courtesy shown to him by those persons with whom his investigations had brought him in contact, and is based upon those investigations on the one part, and on the other upon the last reports of the Belgian railroads, drawn up by Nothomb, minister of public works, and the engineers of that department. M. De Gerstner's report embraces a period of three and a half years immediately preceding its publication, and as the result of his observations he comes to the following conclusions :

Cost. A mile of railroad with a single track, and the necessary buildings and outfit, costs in America, \$20,000—in Belgium \$41,300, or about twice as much.

Tariff. On the American railroads, a passenger pays, at an average, five cents per mile—on the Belgian railroad, only one cent, or one fifth of the former. In America freight

pays, at an average, seven and a half cents per ton per mile.

Speed. On the American railroads, passengers are conveyed with a speed of from twelve to fifteen miles per hour, stoppages included,—on the Belgian roads, at the rate of seventeen miles ; or, stoppages not included, at the rate of from twenty to twenty-five miles.

Traffic. There are, at an average, 35,000 through passengers, and 15,000 tons of goods carried annually over the American railroads—On the Belgian there have been carried, per year, 478,783 through passengers, and the transportation of goods only commenced a short time since.

Gross Income. The same amounts on the American railroads at an average per mile and per year—

From 35,000 passengers, at five cents, \$1,750

“ 15,000 tons of goods, at $7\frac{1}{2}$ cents, 1,125

“ mail and contingencies, - - 200—\$3,075 00

On the Belgian roads the gross income per mile from 478,783 passengers, and the transportation of freight, amounts to 32,000 francs, or per year to

6,003 75

Expenses per mile of travel, for each train. These amount on the American roads, to one dollar—on the Belgian roads, to one dollar and five cents ; or they are nearly the same in both countries.

Number of passengers per trip. In Belgium there were, in each train, at an average of three years and a half, one hundred and forty three through passengers—on the American roads, a passenger train contains forty through passengers on an average.

Number of trips per year. In dividing 35,000 by 40, we obtain 875 as the average number of passenger trips per year, on the American railroads ; and in dividing 478,783 by 143, we get 3348, which represents the average number of passenger trains passing annually over the Belgian roads. As, at the same time, the speed on the latter is greater than on the American roads, it was necessary to employ rails of forty-five pounds per yard : while their weight is generally less on the American railroads.

Expenses per passenger per mile. These are, in Belgium, only 0.73 cents, and in America, $2\frac{1}{2}$ cents, or $3\frac{1}{2}$ times more. The reason of it is, that the American trains contain $3\frac{1}{2}$ times fewer passengers, while the expenses per train per mile, are equal in both countries. It is very nearly the same for a locomotive to carry 40 or 143 passengers in a train.

Annual current expenses. In America the annual current expenses for working a railroad are, per mile—

Transportation of 35,000 passengers, at $2\frac{1}{2}$ cents,	\$875 00
“ “ 15,000 tons of goods at $6\frac{1}{2}$ “	975 00
“ “ the mail, and other expenses,	100 00
	1950 00

Or \$63 41 of every \$100 gross income.

On the Belgian railroads, of every \$100 gross revenue,

the expenses are \$65 59, or per year per mile, \$3937 86

Interest on the capital invested. In America the annual average gross income, per mile of road, amounts to \$3,075 00, the annual current expenses to \$1,950 00, leaving \$1,125 00; which compared with the cost of a mile of road, (\$20,000) give $5\frac{1}{2}$ per cent. interest. On the railroads in Belgium the annual gross income per mile is \$6,003 75, the expenses \$3,937 86, leaving \$2,065 89 as interest on the cost of \$41,300 per mile, or exactly five per cent.

MECHANICS' INSTITUTE.

CONVERSATIONAL MEETINGS.

A peculiar and highly valuable feature in the proceedings of the Mechanics' Institute of New-York, is the introduction of conversational meetings, for the purpose of discussing in a familiar manner any subject connected with the arts, mechanism, experimental philosophy, or other matter of practical utility.

These meetings are held regularly on Tuesday, Thursday, and Saturday evenings of each week, and they no further partake of formality than consists in the election of a chairman and secretary at each meeting; the duty of the former being to

decide questions of order, and of the latter to take minutes of the most important points in the discussions, for the purpose of reference by members. Any member may propose a subject, and persons informed thereon are expected to communicate frankly their opinions, and such facts concerning it as they may deem new or interesting. Questions are asked and answered in a free and friendly spirit of inquiry, and thus not unfrequently a large mass of valuable information is gained.

It is not more than about eight weeks since this plan was introduced, and already the meetings are fully attended, and highly beneficial effects have resulted. The spirit of these meetings is not allowed to flag, as it is agreed that the discussions on any one evening shall not be prolonged beyond an hour and a half; viz. from eight to half past nine at each meeting. They combine the advantages of oral instruction and freedom of restraint; for as in a lecture it would not be decorous to interrupt the course of the speaker's matter, in order to obtain explanation, so, in a mere conversation, interruptions frequently turn the current of discourse. But on these occasions each member is heard with respect until he shall have finished his remarks, and thus each contributes to the information of *all*.

It is purposed to give in continuance, the substance of these conversations, and the following is the commencement of the series. Hereafter it may be deemed proper and just to give the names of such gentlemen as may communicate information that shall be novel, ingenious, or important; and it is anticipated that the subject matter will generally be found replete with interest as well as valuable to the community.

Conversational Meeting—Subject, Engraving.

[Reported for the American Repertory.]

Upwards of two hundred specimens of engraving were exhibited by the members, embracing all the known kinds, and many by the first artists. Among the latter we recognized Hogarth, Pirenesi, Wollett, Heath, Albert Durer, Cozzens, Bartolozzi, Sharpe, Burnet, and others. Many of the specimens were antiques of high value, and the varieties of engraving were in line, stipple, etching, mezzotint, aquatint, siderography, cereography, lithography, (including engraving and etching on

stone,) fluorography, (and impressions therefrom, taken direct from the glass plates,) Pentography, &c.

Engraving was perhaps the earliest art on which the ingenuity of man was exercised. It is spoken of by Moses, and not as a new invention even in his day ; and all ancient history concurs to place it as one of the most antique of the arts. The hieroglyphic figures of the Egyptians afford the best if not the earliest specimens of engraving or carving. To these may be added those of India, in which the caverns of Ellora, Elephanta, and others exhibit striking specimens ; and it is not improbable that there are others of still higher antiquity than those of Egypt. Herodotus describes the shields of the Carians as being ornamented with rude portraitures ; the Saxons likewise, in common with other northern tribes, engraved rude devices on their shields. St. Dunstan, Archbishop of Canterbury, that powerful prelate who exercised an influence more than royal in the tenth century, exhibited considerable skill as an engraver on metals ; and numerous other proofs could be given of the high antiquity and general practice of this art.

Engraving in fact was pursued as a distinct art, nearly three hundred years before the art of printing was invented, being in considerable use in the early part of the twelfth century.

Engravings on wood.—The first material used to engrave upon was wood. Engravings of this kind were printed from as early as 1423, a subject from the apocalypse, being given for an instance. Some writers give to the Chinese the priority of date in wood engravings. A member saw a Chinese book entirely printed from wood cuts ; and Sir William Jones gives an account of *wooden types* being found in a cave in Hindostan. They were supposed to be two thousand years old.

Wood is frequently preferable to copper from its capability of being used in a common press, and from the printing being much cheaper and more convenient. Some wood cuts will give one hundred thousand good impressions, and by stereotyping may be multiplied to any extent. Printers sometimes relieve fine lines by placing thicknesses of paper on the tympan for the darker or stronger parts, and thus materially assist the effect of the engraving, by producing the proper light and shade.

Box and American dog-wood are the kinds in general use, but they sometimes have soft white spots, which are very detrimental. In cutting, the wood sometimes breaks down in the grain, in making narrow lines.

Before a form of types is washed, the wood cuts should be removed, as the *ley*, which is used to cleanse the types, injures the cuts. They should be cleansed separately with spirits of turpentine.

Line Engraving. This is of very early origin; it is spoken of in Exodus. Josephus speaks of two engraved pillars. The shields of the Saxons were engraved. The earliest known date of printing from metallic plates, was about the year 1460. Jackson, on wood engraving, quotes a French author, who speaks of plates by Albert Cunio and sisters in 1200, but the authenticity of the assertion is doubted by him; painting in oil had arrived at great perfection before plates were engraved to print from.

Process. Line engraving was performed by a tool called the graver, but at the present day the subject is generally first etched, and, afterwards, the finer lines and more delicate parts are put in with the graver.

Etching was first practised in or about the close of the 15th century. It is ascribed to Albert Durer, who was the first that excelled in it. Durer was born in 1471—he was a painter, and had studied with *Wohlgemuth*. There are impressions of four of Durer's etchings, dated 1516. The plates are in the British Museum. In etching, the plate of steel or copper is slightly warmed and covered with an *etching ground*, composed of asphaltum and other substances, which is spread evenly over its surface by daubing with a small cushion of leather or silk, and generally slightly smoked over a lamp to give evenness of color, &c. The etching needle, a simple point, is then used to trace the required lines through the ground, so as to expose the copper. A wall of wax, $\frac{1}{2}$ inch high, is placed round the edge of the plate. After being placed in a horizontal position, a dilute solution of some corrosive acid, generally nitric, is poured on the plate, and suffered to remain long enough to corrode the copper where it is laid bare by the needle, the other parts being protected by the etching ground. After pouring off the acid, such parts as are

sufficiently dark are *stopped out*, by protecting the lines with a varnish, similar in composition to the etching ground, and laid on with a brush. The *biting* and *stopping out* processes are then repeated until the etching is done, when the plate is finished with the graver, the larger lines are widened and deepened, and the more delicate ones done afterwards. Skies have been generally done by the ruling machine, but this is now seldom the case.

Good copper plate will give 3,000 good impressions.

“ steel “ “ 10,000 “ “

The plates may be retouched and printed from again.

Printing in colors is sometimes done from line engravings, but more frequently from stippled plates.

Stipple Engraving. This is a variation of *etching*, being executed entirely in dots, marked through the etching ground with the point of the graver or etching needle; after the removal of the ground it is wrought up with the same tools, by pressing the needle into the metal, or picking out with the point of the graver.

Mezzotint Engraving. This invention dates from the middle of the 17th century, and is generally attributed to Prince Rupert. It can be done on either steel or copper plates. The plate is first *rocked*, as it is technically called.

The rocking tool is made of hardened steel, finely toothed on its edge, which is a segment of a circle. With an even pressure the operator rocks it over every part of the plate's surface in every direction, until he raises an even *burr* or roughened surface; in this state an impression from the plate would represent black velvet in appearance.

The artist then uses a scraper, which is a triangular tool, gullied on each side, like the court swords of Louis 16th, so as to present three sharp edges; with this he scrapes off the burr, where he wishes to produce a light impression, using occasionally a burnisher for the high lights. He continues thus scraping more or less, as he requires greater or less light. In other words it is the reverse of an India ink drawing; or, it is like imitating an India ink picture by using white paint on a black ground. The impressions from such a plate appear like a highly finished India ink picture.

Mezzotint engraving on copper will not allow near so many impressions as those from *line* engravings, or from stippled plates; and great objections were made to it on this account, until our talented countryman, Mr. Joseph Perkins, first reduced the process to practical utility, by the introduction of decarbonized steel plates. This was done by him about the year 1814, since which, mezzotint engraving has been greatly in demand, and many beautiful specimens have been given.

Aqua Tinta. This is performed on either steel or copper, but more usually upon the latter. Finely pulverized resin is evenly sifted over the surface of the plates; it is then slightly warmed, so that the particles may attach themselves to the plate, but not sufficiently to cause them to run together; an acid is then poured over the surface as in etching, and an even ground is thus bitten between the particles of resin. The parts required to be light are *stopped out*, and the biting is repeated, when the second class of lights are *stopped out*; and so on in succession until the plate be finished.

The ground is sometimes laid by using a solution of gum which granulates as the dissolving medium evaporates. If a second ground be necessary, the gum will granulate on precisely the same parts as the first.

The mode of printing from metallic plates, is by covering the surface of the plate, which is slightly warmed, with ink, and wiping it off with the hand; this leaves the ink in the incisions but removes it from the surface. A sheet of paper is then placed on the surface of the plate, and both are passed under a roller, with a heavy pressure, whereby the paper is forced into the incisions so as to remove the ink. Wood cuts are printed from, in a manner similar to that of type, by inking the surface with a roller or a ball, and giving a pressure which is but slight as compared with that which is necessary for the copperplate.

Cereography—from *Cera*, wax. This art has lately been brought to a great state of perfection by Mr. Morse, of this city. His process has not yet been made public.

Similar results, however, have been obtained in Europe, and it is much used instead of wood engraving. A company has been established in Edinburgh for prosecuting this art; they

have obtained a patent for it, which promises to be of the utmost importance in facilitating and cheapening the productions.*

One of the members showed a specimen, called *metallic relief*, evidently produced by similar means ; at any rate with similar results.

Lizars, a few years since, covered a plate of copper with a coating of plaster, and after scratching his design through to the copper, he took a cast in type metal therefrom, but found great difficulty in inking the surface and printing cleanly from it, for want of depth. This and similar plans, by the use of wax and other materials instead of plaster, have often been proposed, but until lately, without success. A member suggested the following: cover a highly polished glass plate with a mixture of wax and other ingredients, and trace through it the design; then apply sulphur, which has been worked soft in water after being melted.† With a slight pressure, the sulphur could be forced into the incisions, so as to give, without abrading the wax, a sharp cast, from which a stereotype could be taken, and the fine surface of the glass would insure a good face to the type.

Siderography—(From the Greek *σιδεργω*,—*sideros*, steel.) This art was invented by Jacob Perkins. The method in common use is to engrave the subject on a steel plate, which, when hardened, is transferred by means of pressure upon a softened steel roller with the subject reversed and raised—after hardening the roller, softened steel plates can be impressed, hardened and printed from, ad infinitum, wear of roller only excepted.—Almost all the vignettes of bank bills are thus engraved. It is

* The following remark is from a British Journal: Several specimens of engravings executed under the new process, having been shown us, we can confidently add our testimony to the value of the invention. It is a decided improvement upon wood engraving, and possesses almost, if not altogether, the delicacy of that of copper. The process is an exceedingly simple one. A thin paste is spread over the surface of a sheet of copper or steel; the lines of the picture to be copied are drawn upon the paste, and a stereotype plate immediately taken therefrom. We understand that good judges are quite sanguine of the success of the invention.

† When melted sulphur is thrown into water and worked rapidly by repeated squeezings with the hands, it will be quite soft so as to take very sharp impressions; in a short time after, it becomes exceedingly hard.

now used in the United States mint for duplication of dies for coining.

☞ Lithography and engraving on stone will be fully treated of in a future number.

Subject, Stoves.

A member gave the following history of the use of stoves in this country. The first stove used was the Dutch cockle, or common box stove, of cast iron; for more ornamental purposes the Parisian or French stove was used, which was formed of a large mass of bricks covered with white china-surfaced tiles, handsomely ornamented, and had a small fire place. The friends of this stove argued that the heat given off, by the fire to the bricks, was retained by them for a long time; and was given off slowly, after the fire was expended and the flue shut. These stoves were used for burning wood. To these may be added the *Franklin*, so well known to all Americans of the last century, and invented by one of her most gifted sons. The ordinary ten-plate stove was the next known, which passed into very general use, and was the first to embrace any of the well known scientific principles, connected with the radiation of heat and consumption of fuel. The flue passed up the rear of the stove and returned at the top, between two plates, to the front, where it passed into the pipe, thereby giving a large surface for receiving and radiating the heat.

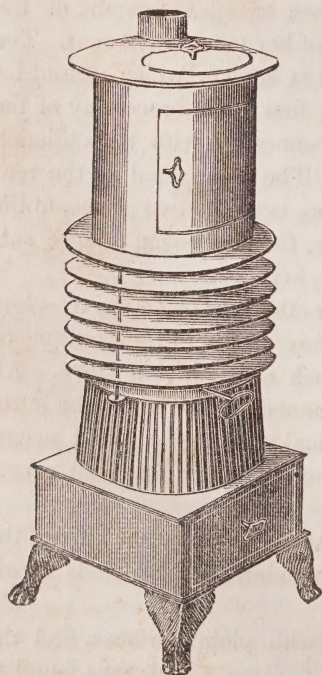
The soap stone stove, and many others followed the ten-plate for the warming of parlors, and were chiefly of the principle of that already described as the French and Parisian stove. All these plans, and many others continued in use until the introduction of anthracite, when a radical change was found necessary; as none of those already mentioned had the draft necessary for its combustion.

The shapes now resorted to were innumerable; from the horizontal to the perpendicular cylinder, with all kinds of arrangements for the grate, &c.

For a long time they were cast with plain surfaces, and the coal burned in direct contact with the iron. This was found to alter the shape of the stove, and soon to destroy it. To obvi-

ate this difficulty they were lined with fire brick, or other bad conductors, by which means a much larger number of the *improvers*, as they styled themselves, passed a majority of the heat, which should have been radiated into the apartment, through the stove pipe into the chimney; and this error, with very few exceptions, still exists. Some inventors, among whom may be named Dr. Nott, ornamented the outside of their stoves with gothic and other ornamental fret-work, thereby much increasing the surface for direct radiation. Each attributed some particular virtue to the construction, as to form, &c.: but in reality the stove presenting the greatest quantity of surface gave the greatest quantity of heat.

It remained for one of the members of this Institute (MR. JORDAN L. MOTT) to observe this fact, which had been passed over by the inventors themselves, and he determined not only to take advantage of his observation by increasing the surface



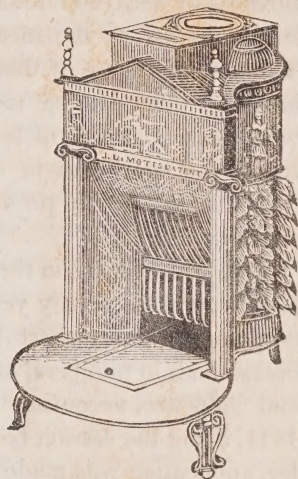
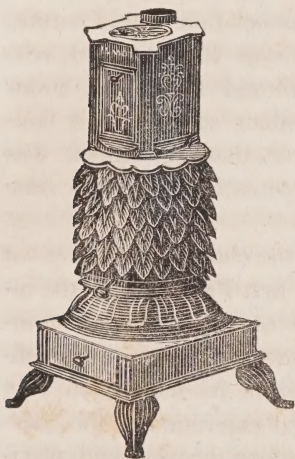
of his stove, but so to increase its radiating as to do away with the necessity of lining the stove at all; believing rapid radiation alone, sufficient to protect the iron from becoming overheated. With this view he constructed a stove, the radiating surface of which was increased 11 times more than a plain cylinder of its size. His first experiment was to construct stoves formed of rings, cast separately, which when placed one above the other composed a cylindric stove, which will be better understood by reference to the cut. The rings to this stove were cast solid, and projecting; consequently, as the inner part of the rings became more heated than the outside,

they necessarily cracked, and the plan seemed for the moment impracticable.



Mr. Mott next formed the rings with the outer edges so shaped as to do away entirely with this objection, and at the same time permit any degree of surface for radiation he might desire to be exposed. With rings thus constructed he has formed stoves of all desired shapes, from the common office or factory stove, to the more elegant parlor stoves and Franklins; all of which are found perfectly practicable and free from the ordinary accidents.

The quantity of heat radiated is so great, that the stove pipe is much cooler than in ordinary stoves, and consequently a larger quantity becomes available for use.



A small stove of this description, exhibited at the Mechanics' Institute, had so great a surface for radiation that it was found difficult to keep up the combustion; notwithstanding, a similar stove, with a little less radiating surface in proportion to its contents, performs perfectly well in its place.

A visitor present gave an account in detail of an urn stove of copper, which he had seen in Paris a few months before. It had no pipe. He stated that Gay Lussac had given as his opinion, that a stove so constructed would heat a room one hundred feet square for twelve hours, and accounted for the phe-

nomena, by stating that, where a pipe is used, ninety five per cent. of the heat passed to the chimney, and but five per cent. is radiated into the apartment, whereas with the urn stove all the heat is usable. He proposes no plan however for getting rid of the gases formed.—ED'S NOTES.

TRANSACTIONS

Of the General Society of Mechanics and Tradesmen of New-York.

THIS very excellent Institution had its origin in the most benevolent of purposes, and has had existence upwards of fifty-four years. It commenced as a private association of individuals, whose objects were to provide assistance to members in sickness or decayed circumstances, and for such other benevolent purposes as the means of the association would permit. The first chairman of this association was Robert Boyd, who held the office during the years 1785 and 1786; and under whose care and that of his equally zealous successors, it flourished and increased to such a degree, that at length it was found advisable to preserve its perpetuation under a state charter.

This was effected in the year 1792, the charter being granted for the term of twenty years, and the first President of the incorporation was Robert Boyd. The society continued to increase both in numbers, and in the power to extend its beneficial influence, according to the design of its foundation. In 1811, being the session before the legal expiration of the charter, application was made with success for a renewal, with privileges extended, proportionate to the enlarged means of utility; the second charter having force until 1833, and restricting the society in the expenditure of its funds to the support of indigent members, or of the widows and children of members, and to the necessary repairs of buildings belonging to the society, together with the incidental charges relative to the general management.

But the society so rapidly increased, as necessarily so benevolent a society would, that, in 1820-21 it was in condition still further to extend its benefits to members and their families;

accordingly an act was obtained to amend the act of 1811, which enabled them to appropriate a portion of their funds to "the establishment and maintenance of a school for the education of the children of indigent or of deceased members of the society, and also to the establishment of an Apprentices' Library, for the use of the Apprentices of Mechanics in the city of New-York."

This very satisfactory progress of the society continued without intermission; and in the year 1833 its charter was renewed until the year 1860. On this occasion further privileges were obtained; for the present act declares, that "the said society shall have power to use their funds for the support of indigent members of the said corporation, and the widows and children of any person having been a member thereof; for the establishment, support and maintenance of a school for the *gratuitous* education of the children of deceased or indigent members; and for the establishment, support and maintenance of a library and *reading rooms*, for the use of the apprentices of mechanics and others, of the city of New-York."

Of the value of the *pecuniary* benefits conferred by this admirable society, some estimate may be made in the mind; but who can calculate the obligations conferred upon the young, in the gift of a sound and moral education, the use of literary works on valuable and interesting subjects, and an invitation to spend their leisure hours in the quiet and rational gratification which commodious reading rooms will afford, instead of the tumultuous and irregular amusements of the town? How vast is the advantage to young persons that their conduct, as seen through such an establishment as this, is silently but vigilantly examined; how much of their future welfare may be traced to the advantages they receive here, and to their deportment whilst they are enjoying those advantages!

But the society has not stopped even here; for as the school and library privileges include the introduction of lectures on scientific and other useful subjects, there has for some time been a regular succession of lectures given by persons eminent in their several departments, which have been highly edifying and instructive, well attended, and doubtless productive of important benefits.

The President of this Society is, *ex-officio*, a director of the Mechanics' Bank of this city. This has tended not a little to the maintenance of its high respectability; and indeed it may justly be said that all the members are endued with a high sense of its importance and are zealous in its support.

The library, which consists of many thousand valuable works, is in excellent order under its careful librarian, Mr. Swan. It is contained in the extensive basement rooms of the society's schools in Crosby street. The schools are airy, commodious, and numerous attended, and the course of education adopted is extremely judicious.

PROCEEDINGS

Of the Mechanics' Institute of the City of New-York.

Wheresoever institutions of this description have been formed, they have invariably resulted in important benefits to the community. It is certain that they have contributed more largely to elevate the mechanic into a man of science and reflection, than could any other lever that could be called into action; and in doing this they have likewise communicated the impulse, which has ripened into a principle of duty, to reciprocate knowledge, and exchange the benefits of practical skill.

The Mechanics' Institute of New-York, is one of those excellent associations for this generous purpose; and during the few years it has been in operation, it has contributed its full share of general good, and given powerful impetus to scientific, and mechanical knowledge. The Institute had its origin in a series of lectures given by Professor John Steele, on chemistry and natural philosophy, in the winter of 1830-1. When it was first formed it consisted of only forty-five members, but so rapidly did the members increase that they were enabled to apply for and obtain a charter of incorporation, in the month of April, 1833. The members have steadily continued increasing, and at this time they amount to nearly fourteen hundred.

The principal objects of the Mechanics' Institute, are the following, viz.

1. The cultivation among themselves of all the useful arts and sciences.

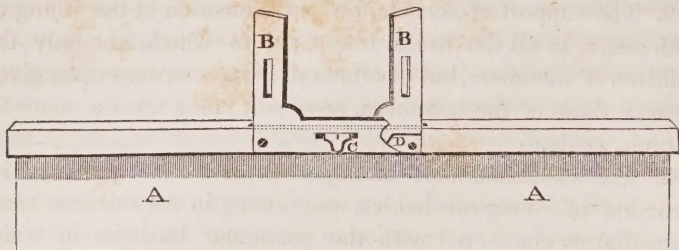
2. The support of schools, for the education of the young of both sexes, in all the useful branches ; to which, not only the children of members, but of others shall have access upon given terms ; those of the members, however, being upon a more favorable scale.

3. The establishments of departments for the practical instruction of young mechanics, and others, in the sciences more immediately connected with the particular business in which each is engaged.

4. Encouragement to skill in the mechanic arts, by the exhibition of specimens at annual fairs, and the gift of premiums, certificates, &c. to those who have distinguished themselves on such occasions.

In the promotion of this excellent design they have established a valuable library, to which considerable additions are annually made ; they have a convenient reading room, a spacious lecture room, a museum of ingenious models of machinery, an extensive chemical and philosophical apparatus, a large and choice collection of minerals, and, in short, have possessed themselves of all the facilities for the dissemination of knowledge. Lectures on various subjects of utility are given every Monday evening, during the winter, to which the families of the members are at liberty to be present ; and these last, which are commonly well attended, have probably assisted essentially in forwarding the ends of the Institute.

In an association, the members of which have so warmly its interests at heart, there can be no doubt of its prosperity in itself, and of its valuable effects on the community. Already have many others in this state been founded, based on the same principles as those of the Mechanics' Institute of New-York ; and with such noble objects in view as those which they contemplate, we believe that there will be no one who can hesitate to bid them ' God speed.'



Report of the Committee of Arts and Sciences of the Mechanics' Institute, on MR. PEARSALL'S ROW-LOCK for Boats.

DESCRIPTION. A, gunwale of the boat; B B, two pieces of metal of the shape described in the drawing, composing the row-lock, which may be shut at pleasure so as to leave the gunwale without protuberances, and the row-lock secure from accidental breaking; C, a button or pin to fasten the row-lock upon, when required to be used. D a raised shoulder, so constructed as to receive the pressure from the point of the L of the row-lock opposite, which has a corresponding shoulder; so that, in either movement of the oar, neither piece of the row-lock can be easily strained or broken.*

The committee are of opinion that the above is a material improvement on former plans:

1. From its shutting up, so as to present a plain gunwale when not in use, and a sufficient row-lock when required.
2. From its economy, and from the high testimonials presented by the inventor.

Respectfully submitted,

JAMES THOMAS, *Chairman.*

Mechanics' Institute, New-York, November 4th, 1839.

Pearsall's row-locks are particularly recommended—

For sail boats, as being entirely out of the way and yet always in their place to be used at a moment's warning.

For passenger boats, as they are rigged for four pairs of

* It not unfrequently happens that boats on the decks of vessels lose their thole-pins, from their liability to be pulled out by ropes sliding along the gunwale, and thereby the lives of persons, accidentally thrown overboard, are often unexpectedly jeopardized, from the boats being found unmanageable.

sculls; one pair only being in use at once, the other six row-locks can be closed out of the way, removing all liability of being broken; and by leaving a smooth surface on the top of the gunwale, adding beauty to the boat.

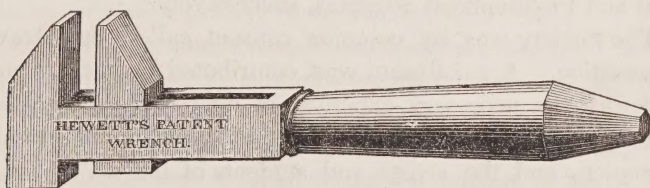
For pilot boat yawls, as they have occasion to unship their thole-pins when taking the yawl on board of the large boat, and when coming alongside in a heavy sea, which is very difficult and dangerous. The thole-pins, being wet and swelled tight, cannot be removed, and are left; consequently they are frequently broken by striking against the side of the vessel; whereas, the above row-locks only require the slide to be drawn, which can be done in an instant, and they drop down out of the way.

For all kinds of boats, as being made of metal, they will last as long as the boat in which they are used.

For all boats rigged for sculls, as, when rowing long oars, the the opposite row-lock can be closed, out of the way of the arm, elbow, &c. of the person rowing; which is very desirable, as every one can testify who is in the habit of rowing in a narrow boat.

For sale at the Oar Establishment, 402 Water street, by the inventor.

JOHN A. PEARSALL.



Report of the Committee of Arts and Sciences of the Mechanics' Institute, on a SCREW WRENCH, invented by HENRY W. HEWET, of Troy.

The engraving will fully illustrate this very useful improvement. It may not be amiss, however, to name its advantages over the common, and other wrenches now in use.

The advantages of the parallel bars as substitutes for the single bar, to hold the jaws of the wrench, are, greater strength and precision of motion to the sliding jaw.

The adjusting nut, being placed at the end of the handle, is always at command, and is a much better arrangement than the sliding spring catch, or the ordinary adjusting screw; as, with the latter, it often happens that there is not room to enter the hand for their adjustment.

With the ordinary adjusting nut, the size of the entire handle, they soon become loose, and in a greater or less degree unfit for use.

JAMES THOMAS, *Chairman*.

Mechanics' Institute, Dec. 15, 1839.

[For the American Repertory.]

NATIONAL ACADEMY OF DESIGN.

In the fall of 1825 several of the artists of this city, feeling the want of harmonious intercourse and improvement in their profession, associated themselves together, for the purpose of drawing from the antique and other models, during the winter evenings, and, as originally proposed, at the house of one of the projectors of the plan. The number who immediately signified their wishes to become participators in the advantages of the scheme proved this arrangement to be too limited, and an effort was made to procure more ample apartments, which they obtained by the generous loan to them of the rooms of the Historical and Philosophical Societies, successively.

The Society was by common consent called the Drawing Association. A small sum was contributed by each member, to defray the necessary expenses of light and fuel. Officers were chosen to manage the business attendant on this primitive formation, and the artists and students of the art became an organized body; but, at that time, with no other intention than that of mutual intercourse and improvement in the art of drawing.

Circumstances of a controversial character, with the American Academy, entirely unnecessary here to be introduced, soon changed the aspect of affairs, and caused the associated artists to project the plan of forming an academy for the encouragement of the fine arts, in conformity with their own views of what such an institution should be. The plan was matured,

and the National Academy of Design was the result. The drawing association consisted of some thirty or forty members, some of them professional artists, some amateurs, and some students of the art; all enjoying equal privileges in the association, and all interested in the creation of the new society. It was obvious that materials so diversified could not enter into the formation of the new Academy, now about to assume a definite character and object, in the same heterogenous mass as in the primitive association. How the one should resolve itself into the other; who should be constituted members of the new society; how they should be classed, or how selected, was the difficulty to be overcome, and was ultimately accomplished as follows: The members of the drawing association, at a meeting called for that purpose, elected by ballot fifteen professional artists from among their own numbers; the fifteen artists so selected, were, by the tenor of their election, empowered to assemble forthwith, and to choose by ballot not less than ten, nor more than fifteen more professional artists, either from within or without the association:—the whole number consisting of the fifteen selected by the original body, and those selected by the fifteen, to constitute the new society. Thus was formed the National Academy of Design.

Its great ruling principle was, and is, that its government should be entrusted entirely to artists.

Its objects were, instruction, exhibition of the works of living artists, and the promotion of mutual intercourse and harmony in the profession.

The work had now fairly commenced. The following extract from the letters of Boydell, an anonymous writer of the period, will give a vivid idea of the early struggles of the infant institution: "Immediately after the organization of the new Institution, measures were taken to open its first exhibition; and, notwithstanding the many difficulties under which they labored, at this commencement of their undertaking, such as the want of convenient and properly lighted rooms, &c., the artists succeeded in collecting together such a display of talent as surprised every visitor of their newly formed gallery; consisting of works of living artists only, which had never before been ex-

hibited, and which, by the rules of the Institution, can never be included in any future exhibition—a plan which ensures novelty at least. The expenses of this, their first year of existence as an Academy, were somewhat greater than the proceeds of their exhibition, and the deficit was provided for by a small assessment upon the members, which was promptly and cheerfully paid. Not discouraged by this result, they immediately determined on another effort in the ensuing year; and, to defray the expenses of the school, they concluded to receive from students a small sum, sufficient to meet the expenses of lights and fuel. In their second annual exhibition—in which was found a more splendid display of living talent than had ever before been presented in this city—they were more successful—their receipts not only defrayed their expenses, but left them something in their treasury. Now, however, their greatest difficulty arose; the room in which the students assembled, to prosecute their studies, had been, till this time, loaned to them, but now the society which had so generally befriended the Academy could spare the room no longer. No alternative, therefore, was left them but to hire a room, or break up their school. An application for assistance to the Common Council was not listened to; they therefore resolved to incur the risk of hiring, for the year, the room in which they had made their exhibition, over the Arcade Baths in Chambers Street.”

In this room the Institution continued until the increase of students, and the number of works of art offered for exhibition, rendered it no longer sufficient for their purposes, and they ventured upon leasing, at a greatly advanced rent, the rooms of the upper story of Clinton Hall, where it was believed ample accommodations would be obtained for all their purposes. This removal of the Academy from Chambers Street, to the Clinton Hall, with its attendant expenses, was a step hazardous almost to the existence of the infant institution; and a combination of unforeseen circumstances rendered the measure one of serious embarrassment. On the approach of the usual time for preparing for the annual exhibition, it was found that many exhibiting members were absent from the city, and, as a consequence, were not likely to send works for exhibition. This de-

prived the institution of the ability to present its usual display of talent. In this dilemma it was proposed that the exhibition should, contrary to rule, consist of works previously exhibited, and (by selection of the artists,) be a review of the most prominent works of the previous exhibitions—no new pictures.—By this means the Academy prepared an exhibition far surpassing any that had been produced under the limited rule of excluding all pictures that had been previously exhibited. Its success was complete—one objection only was made on the part of the society. The unfavorable contrast the exhibition of the yearly product would undergo, in comparison with its more fortunately selected rival. It was, however, resolved, that every sixth exhibition should be a selection from, and a review of, the works exhibited in the preceding five, though the cause that produced the first had happily ceased. For some time the institution continued its progress, varying but little in its duties or its results, gradually increasing its usefulness, and, of course, its expenses. The increased attention given by the public to its exhibitions enabling it always to meet the latter.

After surmounting so many difficulties, it was discovered that it had to contend with a new enemy—and if report speaks truly of the “business” qualifications of the profession—one they were least likely to encounter with any degree of success. The institution was found suddenly to have incurred—if *incurred* it may be called—a considerable debt, and that in a manner the most unusual and unlikely to produce such a result, to wit : by the generous donations of its friends. This singular anomaly may be thus explained. The presents received were “casts” from the antique statues, and other useful material, selected by its friends in Europe, and consigned to the care and use of the Academy in New-York. The result, ultimately highly advantageous to the institution, was otherwise at that time. The freight bills alone were more than the treasury had ability to pay, and, of course, plunged the Academy into debt ; to meet which they had only the revenue of the ensuing annual exhibitions. The receipts of any one of which (at that time) in gross, would not have paid the amount. It was obvious the whole receipts could not be so appropriated. The exhibitions must be

continued—the expenses of creating the same must be paid, to enable the society so to continue them. By continuing them only could they hope to obtain the means, ultimately, of paying the demand. Under this their treasurer submitted to the council a statement of the revenue of previous exhibitions, an estimate of the probable receipts and expenses of future exhibitions, accompanied with a plan for the gradual liquidation of the debt, under the then existing capabilities of the institution. This gave a ray of hope—though the question was naturally asked, Would the creditors consent to wait for payment? Be that as it may, it was the only mode proposed, and the only means in their power to offer, consequently, was unanimously adopted by the council, and the treasurer appointed a committee, forthwith, to make the statement to the creditors, and to endeavor to obtain their consent to the measure. The statement was made, and consent obtained. Two years within the period asked, the institution had the satisfaction to find itself out of debt, and its creditors paid, in full, with interest.

Having overcome this difficulty, the Academy has, from that period to the present, proved prosperous, and gradually accumulated a property which has enabled them to extend their accommodations to the students—to establish the “Life School” in addition to the “Antique,” to award premiums, and otherwise to place the students’ department of the institution on the footing of the most approved European schools of a similar character. They have also by the same means, been enabled to enlarge the accommodations for their annual display of the works of living artists, consonant with the increase of exhibitors.

The demands on the institution prove that they are still in want of accommodation, in many important particulars, to meet the requirements of an increasing body of artists, and to carry out the intentions of the institution. They have, therefore, determined on another removal, to the still more ample and better lighted rooms, in the new building erected by the New-York City Library Society and Athenæum, where we understand it is their intention to fit up their gallery in the best possible manner. The want of direct light, so much complained of in

the present exhibition room, being entirely obviated in their new apartments, by the proper construction of the lights.

We cordially wish them success. They are the pioneers of independence in the arts of design in our country; and every artist who cherishes the true spirit of independence in his profession in harmony with the republican spirit of the institutions of his country, should be with them. C.

We heartily concur in the writer's wishes for the success of the artists. They have produced an institution in the spirit of liberality worthy of the city. They have no salaried offices to fill with members; all the receipts are devoted to the general benefit of the society; and that no error may be promulgated to their injury, as to the uses or manner in which they apply their rapidly increasing funds, we have asked, and been favored with a copy of the last year's treasury report, from which we publish such a summary as will give our readers a general idea of their receipts and expenditures for the year, and the amount accruing over and above the same, to the permanently invested funds of the Academy, which, with the permission of the society we will furnish annually.

Total receipts of the year from all sources, -	\$ 5170 86
Expenses of institution, including exhibition, schools, &c. - - - -	2470 86
Works of art purchased in Europe for the library, by order of the council, - -	700 00
Amount carried to the invested fund of the institution, - - - -	2000 00
	\$ 5170 86

[For the American Repertory]

LYCEUM OF NATURAL HISTORY

IN THE CITY OF NEW-YORK.

In 1817 a few individuals desirous to improve themselves in Natural History, and to diffuse a taste for that branch of knowledge, formed themselves into a Society called the Lyceum of Natural History. It met weekly at the house of some one of

the members, and at the meetings, subjects were discussed which related to the objects of the association. At this time little progress had been made in this city in Natural Science, and the number of members amounted only to twenty-two.

The Literary and Philosophical Society and the Historical Society both of this city had been already founded, but neither of them paid particular attention to Natural History.

In 1818, the Society was incorporated under the above title. The common council of the city soon after granted them the gratuitous use of several apartments in the building in the rear of the City Hall, which had once been used as an Alms House, but which was then repaired and appropriated for other purposes, under the denomination of the New-York Institute.

Here the Lyceum remained ten years, during which it gradually advanced in numbers and usefulness. A library and a museum were formed, and were enriched by donations from foreign societies and naturalists, and especially by those of its own members. In 1824 it received a sum of between two and three thousand dollars, from the Military and Philosophical Society of the United States, composed of officers in the army; they had ceased to meet since 1809, their object having been better accomplished by the establishment of the Military Academy at West Point, and their funds, now transferred to the Lyceum, had been for some time accumulating.

About this time the Lyceum commenced the publication of its "Annals." This work is confined to original articles on natural history, read before the members, and from its nature it cannot be expected to have a general circulation. It is not published at stated periods, but according to the materials possessed by the Lyceum, and its ability to bear the expense. In 1828, the apartments granted by the city were required for public purposes, and the Lyceum was removed to the City Dispensary, in White street, where it continued about eight years. During the latter part of this period, an arrangement was made with the New-York University, by means of which, the students of the latter had the benefit of the library and museum. The location was nevertheless inconvenient, and the accommodations insufficient; and an attempt was made to

raise funds for the erection of a building which might be creditable to the city, and appropriate to the purposes of the institution. In 1829, a subscription for this purpose was set on foot, but the importance of the society was not yet duly estimated by the public, and the amount subscribed was inadequate. A few years afterwards the attempt was renewed, and through the zeal of the then Treasurer, Dr. Jay, and the liberality of our citizens, and especially of the merchants, was crowned with success. A spacious edifice was erected on Broadway, between Prince and Spring streets, of which the Lyceum took possession in 1836. It is of brick, with a basement of granite, fifty feet wide, ninety-two deep, and sixty-five high. It contains, besides a large lecture room, library, room for meetings, and other apartments, a museum forty-seven feet wide, by eighty long, and thirty-five feet high, lighted from the top and at one end, and surrounded by a gallery. The specimens are arranged in cases, in systematic order, with the *name* and *locality* of each affixed, together with the name of the *donor*. The collection is still incomplete, but considering the means of the society and the time elapsed since its commencement, its extent is matter of surprise, and highly creditable to the members. It is divided into four departments—zoology, botany, geology, and mineralogy. The mineralogical cabinet will bear comparison with any in America, and is arranged according to Cleaveland's classification. The donors to whom it is principally indebted are, Dr. Mitchill, who bequeathed to it his entire collection; Mr. J. Dixon, of England; Mr. S. N. Caström, of Sweden; Mr. Wheaton, American Minister at Copenhagen; Dr. J. Torrey; Major J. Delafield; and the Mineralogical Society of St. Petersburg.

The cabinet of shells has lately been much enriched by a valuable donation from Dr. Brinckerhoff, of the United States Navy, who has liberally presented to the Lyceum a large collection in every branch of natural history, made by himself during a single voyage; the shells alone amount to near two hundred species.

The botanical collection contains dried plants, and preserved fruit, and is divided into two sections, American and Foreign.

The latter contains several thousand specimens, including about one thousand collected in Java, by Mr. Blume ; a number from China, presented by Mr. Williams, missionary printer at Canton. The American portion was principally collected by Mr. William Cooper, and Dr. Torrey, and has recently been arranged by Dr. A. Gray, and Mr. R. H. Browne.

The collections of quadrupeds, birds, insects, and fossil animal remains are respectable, and include many curious and interesting objects, but not so complete as the other departments. The library and museum are open to all our citizens gratuitously, under some necessary regulations. The members are divided into honorary, corresponding, and resident. The honorary embrace the most distinguished naturalists at home and abroad ; their number is limited.

The corresponding members are numerous, and include those who make natural history a particular study.

The resident, are those who reside in this city, or its vicinity ; their number is about two hundred.

The Lyceum, like most of our other institutions, which rely for support on individual efforts and liberality, is straitened for funds ; but considering the means it has possessed, the progress made has been vastly greater than could have been reasonably expected, and is highly honorable to its members.

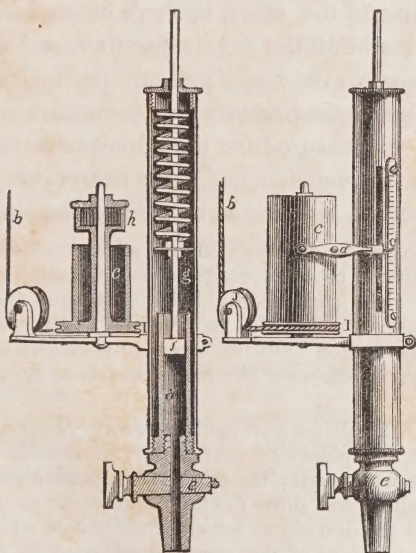
N. B. The Lyceum meet on every Monday evening at seven o'clock, and, upon the introduction of a member, all persons interested may attend. Donations, of books and of specimens for the museum, are respectfully solicited. B.

Lyceum, January 20th, 1840.

STEAM ENGINE INDICATOR.

We are very happy in being able to present our readers with a description of the improved steam guage now in use on board the British Queen ; and also a synopsis of particulars of her late voyage from England, most of the items of which were obtained by means of this instrument. It not only enables the engineer at all times to know the working condition of his engine, but at the same time supplies a written register, which may afterwards be referred to.

It exhibits the density of the steam in the cylinder and the quality of the vacuum at every part of the stroke. It is simple in its construction and easily understood and applied. By it, a steam engine proprietor can ascertain in one minute the working condition of his engine; he can detect neglect in his engineer; can demonstrate the quantity of power required to overcome the friction of the engine, to give motion to the shafts and mill gearing, or to drive the machinery. He can tell the power expended to drive any part of his works; or, if power is let off, he can at any time prove what power his tenant consumes; he can ascertain the friction of the machinery, when using different oils; and can guide himself with certainty in the choice of that which is best. He can ascertain the expenditure of steam, when injecting water at different degrees of temperature; and can compare the saving arising from the use of cold water, with the expense of procuring it. In fact by this instrument, he not only can find out the most economical way of working his engine, but he can measure the expenditure, and regulate the distribution of his power at all times.

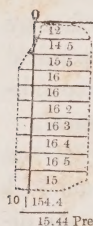


The cylinder of the indicator *a* is equal to $\frac{1}{4}$ of a square inch, the divisions on the scale $\frac{1}{10}$ of an inch, each division representing one pound of pressure on the square inch of the piston.—When the cock *e* is shut the index will stand at *o* or zero; when opened, the pressure of steam will be exhibited above *o* or zero, and the vacuum below.

The cock *e* should be placed in the grease cock top of the cylinder of the engine, or a separate opening may be made for it; on opening the cock *e*, the small cylinder *a* becomes

part of the engine cylinder, and the small piston *f* is acted upon in the same ratio as the piston of the engine ; to the piston rod *g* is attached the index hand *d*, in the end of which is affixed a pencil, which is acted upon by the piston *f*, when raising or falling from the effect of either pressure or vacuum. The small cylinder *c* is covered with a sheet of paper, and at its upper extremity is an ordinary watch spring *h*; the horizontal pulley *i* has a cord *b*, passing from its edge around the perpendicular pulley *j*.

By attaching the cord *b* to the radius bar of the engine, at such a part that its movement will be equal to the circumference of *c*, it will readily be perceived, that from the movement of the piston *f* and the cylinder *c*, the paper will receive a mark similar to the dotted line described in the annexed cut, (which is an exact representation of one taken on board the British Queen reduced to one fourth the original size,) the straight line



o is called the atmosphere line, or line of zero, on the scale. To ascertain the average pressure from steam and vacuum, first divide the atmospheric line into ten equal parts, as represented in the cut ; measure these lines from one dotted line to the other, each $\frac{1}{10}$ of an inch, being one pound ; add all the results together, and divide by ten—this gives the mean pressure per inch on the piston. If desired to know the pressure and vacuum separately, it is only necessary to measure from the atmospheric line to the farther dotted line for the vacuum, and to the nearer dotted line for the pressure, which will give the same average result.

“ To find the power the engine is exerting, find the square inches in the area of the cylinder, multiply by the average pressure, and by the number of feet the piston travels in a minute, divide by 33,000, the number of pounds a horse can raise one foot high in a minute, which gives the horse power. Engineers reckon 10lb. for average pressure, and only 7 for effective power, that is allowing 3lb. to be consumed by the engine itself.

“ From what is shown by the diagram, it will be readily observed, that ports of a sufficient size, and plenty of cold water, are absolutely necessary to make an engine work well ; the tables, from experiments made by Dr. Ure and Mr. Dalton, will show the force the vapor, or uncondensed steam, has to resist the descent or ascent of the piston, which will be according to the temperature of the water discharged by the air pump.

“ The column marked *Libs* is made by adding the results of Dr

Ure's and Mr. Dalton's experiments together, and taking the average, and stating a column of mercury of 30 inches high at 15 lbs.

"An Engine with a 24 inch Cylinder and a 5 feet stroke, making 22 strokes or 22 revolutions of the crank shaft per minute, with an average pressure of 10lb. upon the square inch of the area of the piston, is usually given for a 20 horse power; accordingly the calculation will stand thus : $24 \times 24 = 576 \times 7854 = 452,39 \times 220 = 99525,80 \times 7 = 689680,60 \div 33000 = 21,2$ horse power.

"There is another way of calculating the power : a horse is supposed to draw 200lb. at the rate of $2\frac{1}{2}$ miles an hour, or 220 feet per minute with a continuance, drawing the weight over a pulley, such as winding coals out of a pit. Now $200 \times 220 = 44000$ lb. at 1 foot high per minute, or 1 lb. at 44000 feet per minute ; then taking the above Cylinder by this rule, $99525,80 \times 10 = 995258,00 \div 44000 = 22,6$ horse power, being higher than the former method.

"It is now found in practice, that with sufficiently large openings and plenty of cold water, a vacuum can be made to average 12.80, and at this rate a 24 inch Cylinder would be 29,255 horse, being 8.45 horse power gained. The steam ports should be in proportion to the contents and not to the area alone."

"As the pressure of the atmosphere in round numbers is 15lb. upon a square inch, and the specific gravity of pure mercury is 14000, and of ordinary mercury 13600 ; but as mercury is seldom pure, taking a medium at 13800, it will rise in the barometer usually attached to the condensers of Steam Engines, 2 inches for every lb. of vacuum, so that a vacuum of 28 inches in the barometer will be 14lb. in the condenser ; and if a perfect vacuum could be made, would be 30 inches, or 15lb. ; but this will by no means give a true result for the cylinder, and we have seen 3lbs. of difference between the vacuum of the condenser, and that of the cylinder, on account of the passages being too small."

"If the Engine can be made to work without the shafts, its own frictions may be ascertained : in the same manner, by the Diagram, also the friction of the shafts or any particular part of machinery. The friction of the Engine will vary according to the simplicity of construction, the height and distance the water has to be brought, and the order in which its parts are kept : in general it will be $1\frac{1}{2}$ or 2lbs. for every square inch of the area of the piston. The various qualities of oils may be tried in the same manner. In a Cotton Factory in Glasgow, the Engine was supposed to be overloaded, and drove the works with great difficulty, till a better kind of oil was used, when the effective power required was reduced 2lbs. upon the square inch.

"The Instrument will apply equally well to the condenser, or pumps, by having a cock made to fit it in any convenient situation, and will answer all the purposes of the mercury barometer, and also to try the pressure of steam in the boiler, when it does not exceed 9lb. upon the inch.

"It will be necessary to use a Diagram in all trials, as the degree of vacuum will be pointed out by the index and scale, and unless there has been some alteration in setting the valves, or in the quantity of cold water, will be pretty uniform. A scale accompanies the instrument,

divided into 10ths of an inch, representing pounds, one of the divisions at the end is divided into 5, and by estimating the half between the division will be 10ths of a pound."

The following table shows the average workings of the British Queen Steam Ship, from the time of her leaving Portsmouth until her arrival in N. Y. in Nov. last.

November.	Pressure of Steam, per sq. inch.	Expansion Valves, showing at what part of the stroke the cut off took place.	Degree of vac- uum on the condensed side of the piston.	Revolutions of the Engine per minute.	Speed of the Ship in knots per hour.	Consumption of coals per hour.		Consumption of coals per day.
	Lbs.		Inches			Cwts.	Qrs.	
4	4 7	2-8 cut off.	29 $\frac{1}{4}$	10 4	7 6	23 3		28 2
5	4 9	2-8	29 $\frac{1}{4}$	9 5	6 4	25		30
6	4 6	2-8	29 $\frac{1}{4}$	11 7	8 4	26		31 4
7	4 9	2-8	29 $\frac{1}{4}$	11 3	8 4	24		28 16
8	4 8	2-8	29 $\frac{1}{4}$	10 8	7 6	24		28 16
9	5 0	2-8	29 $\frac{1}{4}$	12 3	9 4	28		33 12
10	4 8	2-8	29 $\frac{1}{4}$	12 5	8	25 2		30 12
11	4 8	3-8 ^{11 to 12} A. M.	29 $\frac{1}{4}$	11	7 2	26		31 4
12	4 8	2-8	29 $\frac{1}{4}$	11	7 6	27		32 8
13	4 9	2-8		9	5 4	19 2		23 8
14	4 7	2-8		8	4 4	18		21 12
15	4 6	2-8		8 8	5 4	19		22 16
16	4 8	2-8	29 $\frac{1}{4}$	12	7 6	27		32 8
17	4 9	2-8	29 $\frac{1}{4}$	12	9	27		32 8
18	4 5	4-8 ^{10 to 12}	29 $\frac{1}{4}$	12 8	9 2	27 2		33
19	4 8	4-8 ^{12 to 1}	29 $\frac{1}{4}$	12	9	27 2		33
20	3 3	^{4-8 8 hours} 3-8 8 "	29 $\frac{1}{4}$	13	9 2	28		33 12
21	4 6	3-8 18 "	29 $\frac{1}{4}$	12 5	7 4	27 1		32 14
22	4 7	3-8 14 " ^{4-8 4 hours}	29 $\frac{1}{2}$	14 3	8 4	31 2		37 16
23	4 8	5-8 18 "	29 $\frac{1}{2}$	15 01	10 2	33		38 12
Consumed from noon till arriving in New-York...								16
" between London and Portsmouth.....								70
Total consumption.....Tons,								702

Mr. P. R. HODGE, of this city, is now engaged in constructing a High Pressure Indicator, similar to that of the British Queen; and from his well known practical knowledge, we are led to expect a very perfect instrument.

Ed.

The following table shows the force the vapor or uncondensed steam exerts in resisting the descent or ascent of the piston, which will be according to the temperature of the water discharged by the air pump.

Fahrenheit Temperature.	Force in Inches of Mercury.		Libs.*
	URE.	DALTON.	
32	0,200	0,200	0,100
40	0,250	0,263	0,128
50	0,360	0,363	0,181
55	0,416	0,443	0,215
60	0,516	0,524	0,260
65	0,630	0,616	0,311
70	0,726	0,721	0,361
75	0,860	0,856	0,428
80	1,01	1,01	0,505
85	1,17	1,17	0,585
90	1,36	1,36	0,680
95	1,64	1,58	0,805
100	1,86	1,86	0,900
105	2,10	2,18	1,07
110	2,53	2,53	1,26
115	2,82	2,92	1,43
120	3,30	3,33	1,50
125	3,83	3,79	1,92
130	4,36	4,34	2,17
135	5,07	5,00	2,52
140	5,77	5,74	2,88
145	6,60	6,53	3,28
150	7,53	7,42	3,74
155	8,50	8,40	4,22
160	9,60	9,46	4,76
165	10,80	10,68	5,37
170	12,05	12,13	6,04
175	13,55	13,62	6,75
180	15,16	15,15	7,58
185	16,90	17,00	8,47
190	19,00	19,00	9,50
195	21,10	21,22	10,58
200	23,60	23,64	11,81
205	25,90	26,13	13,01
210	28,88	28,84	14,43
212	30	30	15

* See pages 48 and 49.

FOREIGN INVENTIONS NOT PATENTED.

INDICATOR OF THE LEVEL OF WATER IN BOILERS. M. Pascot has invented an instrument, something on the principle of Leslie's differential thermometer, to inform one of the height of water in boilers. It consists of a recurved tube, and containing a liquid, open at both ends, of which one end is in communication with the upper interior of the boiler, and the other with the lower. The difference of pressure at the two ends is obviously due to the height of water in the boiler, and therefore measured by the height of the liquid in the tube.—*Railway Magazine*.

We must confess our ignorance of the cause why, under this arrangement, the pressure should not be the same whether received from the upper or lower interior of the boiler.—ED.

WIRE SEWN BOOTS AND SHOES. In the *Bulletin d'Encourt*, Sept. 1839, it is announced that M. Seller of Paris, had secured a patent for the right of using brass wires for attaching the upper leather to the welt of boots and shoes. This metallic thread, he asserts, allows neither moisture nor dust to enter the shoe, nor does it rip. The sewing is performed with as much ease as with waxed thread, nor is the work more costly.

BRICKS. A machine has lately been introduced on the extensive works of James Hunt, Esq. of Rowden Hill, near Chippenham, for making bricks, which has excited much curiosity. The cylinders revolve about once a minute, making, in the course of such revolution, thirty two bricks.—*Taunton Journal*.

GAS PIPES DISPENSED WITH. In Vienna, at present, according to a simple and perfectly secure method invented by M. F. Derionet, gas is conveyed in hermetically sealed bags, on carriages constructed for the purpose, from the manufactory to all parts of the town, daily; by which the expense of laying down pipes in the street is avoided, and the article supplied to the consumer at a proportionably reduced rate. This plan would offer immense advantages to the companies in London and other large manufacturing cities, by saving the great cost of their miles of pipe, and the immense expense of supplying the gas to each house.—*Inventor's Advocate*.

The above appears so well authenticated that we are compelled to believe it; but the eventual saving must be very doubtful, unless the bags will carry themselves.—ED.

IMPROVED SAFETY LAMP. A valuable improvement on the safety lamp has been suggested by Mr. Price, of Gateshead. It consists in

placing what is called a "bull's eye" in the side of the wire gauze, and surrounding it by a metallic reflector, by which the light is concentrated, and its effects increased six fold. To guard the lamp from accident, it may be fitted into an iron box, with an open side. For obviating the great and acknowledged defect of the present lamp, viz. the insufficiency of light, and still preserving its important advantages, Mr. Price's invention seems exceedingly well adapted.—*Newcastle Jour.*

PAPER. Messrs. Dickinson & Co. paper makers, London, manufacture paper, interwoven with threads of silk; and it has been proposed to use this paper for envelopes under the new system of penny postage.

The Trenton Banking Co. New Jersey, have used paper of this description for many years.—**ED.**

NEW MUSICAL INSTRUMENT. Decidedly one of the most ingenious musical instruments for years presented to the public, has been lately invented by Mr. Jenkinson, the organist of Lurgan church. The principle though not altogether novel, is improved upon in a manner quite unique. It consists of a large violin body, without neck or finger board, placed horizontally on a frame, having a greater number of strings than the violoncello, which are acted on by a bow at the one end, and a key board, as in the pianoforte, answering to the left hand of the violin player. The entire of the strings are at once under the movement of the bow, and to avoid the discordant effect which must ensue when a piano tone is required, any string is made removable at pleasure, from the touch of the bow by the simple contrivance of a few treadles wrought with the foot, and connected with a damper in the inside of the instrument. One great beauty of the invention is, that by the judicious disposition of the stops, each one produces the full chord of any key in which the performer thinks proper to play. The tone is most powerful, and from the vast variety of notes capable of being produced, it forms one of the best orchestral instruments which we have seen. The writer heard it accompanying a grand piano, and the tone of the latter, in some instances, was wholly drowned by the strength of Mr. Jenkinson's instrument.—*Belfast News Letter.*

Most instruments, thus formed, have been found impracticable, from the difficulty of tuning them, or of preserving them in tune.—**ED.**

RIDDLE'S SPIRAL EVER POINTED PENCIL. Riddle's, or S. Mordan & Co's. patent ever-pointed pencil cases are in the hands of every one who can afford to use so very convenient an instrument for writing; but defect has always been obvious in the tendency of the "motion" part to get loose and out of order. Mr. G. Riddle has very lately perfected a pencil case, by which this is completely prevented, nothing external being able to come in contact with the motion. The appear-

ance of the case is perhaps neater than that of cases on the old principle, while it has all the advantages, in the reserve of leads, &c. which they possessed. We think it will displace them from the public favor. A writer in the *Inventor's Advocate or Patentee's Recorder* speaks most favorably from experience of this spiral pencil.

Messrs. Lownds & Co. of Philadelphia, have manufactured an article similar to the above for several years.—ED.

IMPORTANT DISCOVERY. It seems that Mr. Rogers, during a course of chemical studies, undertaken to beguile the pain and tedium of a protracted illness, has hit upon an invention which is likely to prove of great national and domestic importance. He has found that the *Anthracolite* amalgamated with another substance equally cheap and common, acquires the extraordinary property of *effectually* and *certainly* preventing the oxidations of metals under all circumstances. Thus an article of the highest polished steel may be exposed to the air or water, for any length of time, and brass and copper surfaces *immersed in acids* without the slightest trace of oxydation becoming perceptible. The great importance of this discovery will be manifest in the fact as appears from a calculation of Dr. Dolton's, that more than a million sterling is lost by individuals and the public yearly, through the destruction of various descriptions of machinery, military stores, arms, &c. &c. by oxidation. We understand that Mr. R. does not attempt to offer any *rationale*, of the above singular effect, but inclines to an *opinion* that it is the result of some obscure galvanic action. The experiments will be tested at the next meeting of the British Association, preparatory, we believe, to an application to parliament on the subject.

West Briton Advocate.

The present method, used by the Sheffield and Birmingham manufacturers to prevent oxidation, is to immerse the polished parts of cutlery in lime water, and dry them rapidly. This proves fully sufficient to prevent rust during an Atlantic voyage.—ED.

MATERIAL FOR LIGHTING. An interesting experiment was made at Bordeaux a few days ago, in the presence of the Mayor, on the husks of grapes when pressed, and the lees of the wine, in order to show their use for the purpose of lighting. A pound of the dried husks put into a red-hot retort gave, in seven minutes, two hundred litres of carburetted hydrogen gas, free from smell, and which burnt with an intense light, and free from smoke. A second experiment with the dried lees was equally satisfactory.

CANDLES. A French chemist has discovered a mode of making tallow candles to resemble wax candles, both in color and in burning. The process employed to convert the tallow into white wax is very ingenious. It consists of various operations of boiling, purifying, and

pressing. An hydraulic press, wrought by a steam engine is used. While the pressure is applied, a dark yellow oil is squeezed from the tallow; the expulsion of the oil leaves the substance of the tallow hard and white like wax. So close is the resemblance which these compressed tallow candles have to wax candles, that no person, without a close examination, could discover the difference, and they are only one half the price. Large quantities are now manufactured at an establishment in London. They are unquestionably a great improvement, and must soon supersede the common tallow candle.—*Manchester Herald*.

The above bears a strong resemblance, so far as can be collected from the description, to the stearine candles, which have long been made from tallow, and are now manufactured in this country from the refuse of whale oil,—technically called *whale oil foot*.—ED.

CLOTH MAKING WITHOUT SPINNING OR WEAVING. Among the many extraordinary and truly wonderful inventions of the present times, is a machine for the making of broad or narrow woollen cloths without spinning or weaving; and from our acquaintance with the staple manufacture of this district, after an inspection of patterns of the cloth, we should say there is every probability of this fabric superseding the usual mode of making cloth by spinning and weaving. The machines are patented in this and every other manufacturing nation. The inventor is an American, and appears to have a certain prospect of realizing an ample fortune by the sale of his patent right. We understand patterns of this cloth, as well as a drawing of the machinery, have been shown to many of our principal merchants and manufacturers, none of whom have expressed a doubt but that the machinery appears capable of making low cloths which require a good substance. Should it succeed to anything near the expectation of the patentees, its abridgement of labor, as well manual as by machinery, will be very great. We find that means are already taken to introduce this machine among our continental rivals: a company of eleven gentlemen in London, have deposited five thousand pounds with the patentees, who have ordered a machine for them; when finished they are to try it for one month, and if at the end of that time they think it will succeed, they are to pay twenty thousand pounds for the patent right in the kingdom of Belgium, and it will of course be worked there. We are therefore bound, in duty to our country and her manufacturing interests, to adopt such facilities as will prevent us from falling into a position below our rivals in other countries. We are informed that the machinery for the production of this patent woollen felted cloth will be tried here in a week or two, under the superintendence of the inventor, by a cloth merchant who has an exclusive license, but is about to associate with him twenty other respectable business men, for the purpose of sharing the expenses of giving the invention a fair trial. It is calculated that one set of machinery, not costing more than six hundred pounds, will be capable of producing six hundred yards of

woollen cloth, thirty six inches in width, per day of twelve hours.—*Leeds Mercury.*

Carpets have been manufactured, for some years, on a similar plan, by Mr. Haight, of this city.—Ed.

RAILROAD SPEED ON THE WATER. A nautical gentleman is about to come forward with a new application of steam to purposes of navigation, by means of which, without paddles or an external apparatus, he undertakes to carry vessels through the water as swiftly as carriages pass along railways on land. He calculates that his discovery will enable the voyagers to pass with ease from Dover to Calais in an hour.—*Dublin Mail.*

The proposer does not appear to be aware, that at a greater speed than thirty two miles an hour, the boat would carry a body of water along with it equal to itself in size. The only attempt, even theoretically, which promises to do away with this difficulty, will be found in William Van Loan's patent for a marine railway, granted January 15th, 1831.—Ed.

MACHINE FOR BEATING HEMP. M. Decosten has invented a new machine for beating hemp, which accomplishes its object in a speedy, complete, and economical manner; this machine is at present employed at the spinning factory of Pont-Remy, department of the Somme. Under the system at present in use one man cannot prepare more than fifteen pounds of hemp per diem, and even that but imperfectly; with the new machine he can prepare one hundred and fifty pounds, and the operation is much better performed. This invention, although applicable to the preliminary steps in spinning, may effect a sort of revolution in that trade; for the machine is said to be cheap and of very simple construction.—*Reading Mercury.*

NEW ENGINE. A gentleman of Liverpool announces that he has invented a new engine, immensely superior in every respect to the old steam engine. The power is created by air and steam. It will consume only one half the quantity of fuel of the old one; and the rapidity by which a vessel propelled by it will sail, will enable it to perform a passage to America in six days. Owing to a particular way in which the power acts upon the vessel, twenty miles per hour can be realized with the greatest possible ease. The weight of machinery will be only one-half that required by the old steam-engine, and instead of straining and weakening the ship, will brace and strengthen it. By this method the steam power is more than doubled.—*Reading Mercury.*

So far as can be surmised from this loose description, the above appears similar to Bennett's plan, which has been in *experimental use* on the Hudson for two years.—Ed.

STEAM LOCOMOTION, by M. Dietz, adapted to common roads. In this machine, the steam does not act directly on the axle of the locomotive, but is supported by six wheels; besides which the engine has a free oscillation by means of powerful springs; two other wheels of greater diameter placed between the engine and the carriage, for the purpose of combining the action, serve to communicate throughout the system the impulse which they themselves have received from the motive power by the means of a never-ending chain.—*Reading Mercury*.

This invention is so badly described that we cannot venture an opinion as to its merits. Never-ending chains have always been found a never-ending cause of accidents with locomotives.

ED.

PORTABLE BAROMETER. A new portable barometer, by M. Bunten, is the subject of a report by M. Arago, to the Academy of Science at Paris. This new machine, without any copper case, and without a plate to mark the degrees, is still very simple, more convenient, cheaper, and less subject to fracture than other barometers. Instead of the case marked with the degrees, the degrees are engraved on the tube itself. A shifting piece supporting the *vernier* is used to mark precisely the height to which the mercury rises; the cistern is of iron, which may be screwed and unscrewed at pleasure, either to lengthen or shorten the column for the purpose of neutralizing the change of temperature. This barometer will cost about seventy francs, including its wooden case, which forms a stand; whilst the cost of common barometers used by travellers is about two hundred francs.—*Reading Mercury*.

INGENIOUS INVENTION. We have before us one of the most remarkable contrivances we have of late seen. It is a specimen of a pair of skates, invented by Mr. William Wallace of Newtownards, watchmaker, and is in the highest degree creditable to that gentleman's scientific skill and perseverance. The machinery of this little locomotive is so arranged, that it is equally serviceable on ice or on a smooth footpath, (a flagged footway, for instance.) It consists of two perpendicular plates of iron, with pieces inserted between them, to allow a free rotary motion for three wheels, revolving along the extent covered by the foot. These wheels revolve in the action of skating, and, with the addition of a horizontal plate of wood, elevates the sole of the foot above the surface. There is, also, a large wheel at the toe-end, with a ratchet or click-wheel attached, on the outside of one of the perpendicular plates, for the purpose of keeping the one foot from retrograding, while the other is progressing forward. After having seen this machine, we are somewhat surprised that a mechanical idea of the same kind has not before suggested itself to some of our ingenious countrymen.—*Belfast Whig*.

A similar contrivance is used by the Ravel family in their representation of "the Skaters of Wilna."—ED.

A TRANSPARENT WATCH. A watch has been presented to the Academy of Sciences at Paris, principally formed of rock crystal. The internal works are visible; the two-teethed wheels which carry the hands are rock crystal; the other wheels are metal, to prevent accidents from the breaking of the springs. All the screws are fixed in crystal, and all the axes turn on rubies. The escapement is of sapphire, the balance-wheel of rock crystal, and its springs of gold. The regularity of this watch as a time-keeper is attributed by the maker to the feeble expansion of the rock crystal on the balance-wheel.—*Coventry Herald*.

THE GURNEY LIGHT. The chapel was lighted by a single Bude light, suspended from the centre of the cieling, which diffused ample illumination throughout every part of the chapel, of a beautiful pure white light, and its effect was agreeable in the highest degree. Upwards of a thousand persons were present.—*Sheffield Independent*.

IMPROVED LAMP FOR STEAM VESSELS. On Wednesday evening, the Polyphotal lamp, and reflector of single curvature, for steam vessels and other purposes, the invention of Mr. Scott Russell, A. M. was shown at the rooms of the Society of Arts, where it excited much interest. We understand that through the kindness of Mr. Hamilton, of the general steam navigation company, it is to be exhibited on trial to-night, on board a small steam vessel, which will leave Newhaven at seven o'clock, and will ply between Granton pier and Leith. Messrs. Smith & Co. oilmen, and lamp makers to the Queen, 1 Blair street, mention that the effect of the light will be of the greatest advantage on board vessels in observing objects on the sides, and at a distance.—*Edinburgh Courant*.

MARINE STEAM ENGINE BOILERS. M. Cousté proposes to adapt an apparatus to the boilers of marine engines, supplied with salt water, by which the crystals of common salt are removed as fast as they are deposited on the heated surfaces of the inside of the boiler; and he hopes by his invention to avoid the loss of heat, which is occasioned by the process at present employed for getting rid of the salt, in blowing off a quantity of the hot saturated solution at stated intervals.

Hall's condensers for re-supplying the water to boilers are likely to prevent the necessity for M. Cousté's invention.—ED.

STEAM AND ITS APPLICATIONS.

The Steam Engine.—The following account of the ingenious invention of Hero, of Alexandria, makes one regret the causes which diverted men's minds during so many ages from following it up to its ultimate results. Had steamboats and railroads been in operation for the last two thousand years, how different would be the present state of the human race! I find the first example of motion produced by steam in a toy much more ancient than the organ of Gerbert, viz. in the *Eolipyle*, of Hero, of Alexandria, the date of which ascends to one hundred and twenty years before our era. It will perhaps be difficult, without the

help of figures, to give a clear conception of the mode in which this little piece of apparatus acts; but I shall nevertheless make the attempt. When a gas escapes in a given direction from the vessel which contains it, this vessel has a tendency to move in a diametrically opposite direction, owing to the force of the reaction. The recoil of a musket when discharged is nothing more than this. The gas produced by the inflammation of the saltpetre, charcoal, and sulphur, issues into the air in the direction of the barrel; that direction prolonged backwards, abuts at the shoulder of the person who has discharged it, and it is upon the shoulder, therefore that the gunstock acts with violence. To change the direction of the recoil, all that is necessary is to change the direction in which the gas issues. If the barrel, closed at its extremity, were pierced by a lateral opening at right angles to its direction and horizontal, it would be laterally and horizontally that the gas of the powder would escape,—it would be at right angles that the barrel would produce its recoil; and it would be upon the arm, and not upon the shoulder, that it would be felt. In the former instance, the recoil operates upon the individual who has fired the piece, from before backwards, with a tendency to throw him down; in this latter instance, it would have a tendency to make him whirl round upon himself. Were we then to attach the barrel, constantly, and in a horizontal position, to a moveable vertical axis, at the moment of being discharged it would more or less change its direction, and would cause that axis to revolve upon itself. Still maintaining the same arrangement; suppose now, that the vertical rotative axis is hollow, but closed at its upper extremity; that it abuts at its lower extremity, like a sort of chimney in a boiler producing steam, and that, moreover, there exists a free lateral communication between the interior of the axis and the gun-barrel, so that the steam, after having filled the axis, penetrates into the barrel, and issues from it at the side by its horizontal opening; then this steam, in escaping, will act, except in the degree of its intensity, in the same manner as the gas disengaged from the powder in the gun-barrel which was stopped at its extremity and pierced laterally; only, that in this instance, we shall not have a simple shock merely, as happens in the violent and instantaneous explosion of the musket; but on the contrary, the rotatory motion will be uniform and continuous, as the cause which produces it; and, finally, were we, instead of having a single musket, or rather a single horizontal pipe, to adapt a number of them to a rotary vertical tube, then we should have before us, with some unessential differences, the ingenious apparatus of Hero, of Alexandria.—*Arago's Life of Watt.*

Steam Vessels.—The total number of British and Irish steam vessels amounts to seven hundred and fifty-six; of these four hundred and eighty four may be considered as river steamers and small coasters; and two hundred and sixty two as large coasters and sea going ships. The computed tonnage is one hundred and forty thousand seven hundred and eighteen, and the horse power of the engines fifty-six thousand four hundred and ninety. The increase of steamers in 1837 over 1836, was seventy-eight; and that of 1838 over 1837, fifty nine registered vessels. From a report presented to the American

Congress in December last, we learn that the whole number of steam-boats in the United States was then estimated at eight hundred, which exceeds by thirty-four the number in the British Isles, but falls short by ten of the number in the British Isles and Colonies together. The tonnage of the American steamboats was one hundred fifty-five thousand four hundred and seventy-three, which is very little greater than the home British tonnage. The aggregate horse power of the engines was fifty seven thousand and nineteen, also very near ours. The three largest American steam-vessels were of eight hundred and sixty, seven hundred and fifty-five, and seven hundred tons, respectively.—*Leeds Mercury*.

The new steamboat Alice.—A fine iron steam-boat, the property of Lord Francis Egerton, was recently launched from the yard of Messrs. Page and Grantham. It is about one hundred and seventy tons burthen, old measurement, is neatly fitted up, and is a handsome and lively looking boat on the water. With the whole of her machinery, fuel, &c. on board, her draft of water is only four feet six inches. She has two engines of thirty horse power each, made by Messrs. Davenport and Grindrod, of the Caledonian Foundry, in this town, upon a novel and improved construction. Their peculiarity consists in the fixing of the cylinders on an angle of forty-five degrees in the form of a rectangle, with the hypothenuse at the base, so that they act as a stay and support to each other. No side levers or counterbalances are required; and, the working parts being fewer than in ordinary engines, they are less liable to derangement, and not so much exposed to wear and tear. These engines are exceedingly compact, and have realized all that was contemplated by the ingenious makers; ample power, ease in working, and great strength, combined with unusual lightness. A very short trip only was intended on this first occasion, but the speed of the vessel was so satisfactory, and the gratification of all on board consequently so great, that she proceeded up the river, a distance of twelve or fourteen miles and back, accomplishing the trip "out and home, in about two hours."—*Mercury*.

Glasgow and Liverpool Steam-ship Achilles.—We have had the pleasure of inspecting this new addition to the elegant steam craft for which the Clyde is so justly celebrated, and will venture to affirm, that a more splendid or more unique specimen of naval architecture is not at this moment afloat anywhere "throughout the world's vast range." For gorgeousness of effect; for tasteful decoration; for an admirable combination of the *dulce et utile*; the Achilles excels every thing of the kind it has been our fortune to encounter. Greenock has the honor of her construction, having been launched from the yard of Mr. Robert Steele, one of the most famous ship-builders on the Clyde. We have not taken the trouble to ascertain her exact dimensions; her length, her breadth, and depth; but to our eye her symmetry appears to be perfection itself. She has what is called a flush deck, with a rounded stern, and, looking from the wheel forward to the bends, the spectator is struck with something like astonishment and admiration at her great length; the view being uninterrupted by any intervening

object of comparative magnitude. Nor is this feeling lessened by a visit to the engine house. Descending by an elegant flight of steps, the visitor finds himself on a platform kind of gallery, which runs round three sides of the room, and is separated from the machinery by brass railing. At one glance we have all the complicated details of a ponderous machine of tremendous power in active operation. The engines we are told, although rated at four hundred and thirty horse power, are equal to the force of four hundred and ninety. They are the production of Messrs. Caird & Co. of Greenock, whose machinery will stand comparison with any in the world. A staircase on either side of the vessel conducts to the grand saloon, the vestibule of which is done up in imitation oak, in the Gothic style, which, altogether, has rather a sombre and subdued effect. Proceeding a little way towards the interior, the *coup d'œil* becomes positively magnificent. The whole of the walls and the doors leading to the sleeping cabins are composed of rosewood and ivory, and are decorated by pannels in *paper maché* from the manufactory of Messrs. Jennens and Bettridge of Birmingham. As works of art, they have not, we believe, been surpassed by anything of the kind ever before produced in this country. The pannels are twenty eight in number, four of which are very large, and consist of historical subjects, some original, and others copies from the works of celebrated masters. The first represents the triumphal entry of Alexander into Babylon; the second exhibits the view of a Grecian seaport, and the arrival of a victorious fleet; the third describes the Olympic games, the combats of gladiators, &c.; the fourth gives a representation of the Hippodrome, the temple of victory and chariot races. Each of these subjects is depicted by the artist with the vividness and freshness of life. The various groups of Grecian, Egyptian, and Persian figures, the richness and brilliancy of the costumes, the colossal statues, temples, and columns, in their architectural grandeur and beauty, furnish a vivid representation of the barbaric pomp and magnificence of by-gone ages. The smaller pannels are divided into classes, devoted to the illustration of particular objects. The first series represents full length figures, emblematic of victory, commerce, and the arts and sciences, surrounded with beautiful ornamental work, drawn in imitation of *alto-relievo*: the whole surmounted with the arms of Liverpool and Glasgow. The second embraces mythological subjects, representing the triumph of Neptune, Juno, and the Graces, Acteon, &c.; the whole adorned with an emblematic framework. The third comprises mosaic heads, and emblems, ornamented with arabesque foliage, birds, flowers and fountains. Viewed separately, each of these paintings is an exquisite specimen of the advanced state of this department of our manufactures and the fine arts; and, as a whole, they form unquestionably one of the most unique and splendid collections of the kind ever produced. The saloon is lighted from above by two cupolas of stained glass, round the basements of which are delineated a variety of subjects, illustrative of the siege of Troy, from designs by Flaxman. In an alcove looking towards the stern end of the apartment, is placed a figure of Achilles, in the attitude in which he is generally represented. The fire places have ornamented marble mantle pieces, all finished in the first style of

the art, and the sleeping berths are admirably fitted up with a view to economy of space, elegance, and comfortable accommodation.—The interior decorations have been got up under the superintendence of Mr. A. S. Cleland, of this city, the architect and furnisher, and they certainly reflect great credit on that gentleman's taste and skill, both in design and execution. Such are a few of the leading features of this floating palace; to enumerate the whole would exceed the limits of a newspaper. We shall conclude, therefore, with expressing a hope that the good ship Achilles will secure an amount of public patronage in some degree commensurate with the spirit and enterprise of the owners, Messrs. Martin and Burns of Glasgow.—

Liverpool Standard.

The new steam ship "New-York."—The "New-York" is now on the stocks, at the yard of Messrs. Wilson, North Shore, and is rapidly advancing towards completion. She is a noble looking vessel; superior in tonnage to the Liverpool, belonging to the same company; is of a beautiful model, and built in as substantial a manner as any of Her Majesty's ships. The following are her dimensions; length over all, 235 feet; beam of the hull, 36 feet 6 inches; beam over paddle boxes, 60 feet; depth of hold 22 feet; tonnage, (supposed new measurement,) 1600; horse-power of engines 420. The frame of the New York is of English oak, the bends and clamps of English and African oak. Her bottom is of American elm, and Baltic timber. On the deck, the New York has a very noble appearance, from her length and beam, and her unencumbered deck room. It is remarkable that she is about the same length over all as the Liverpool, (235 feet,) and that her principal cabin will also be found the same length, (75 feet.) She has, however, 6 feet more beam than that favourite vessel, which it is considered will give her considerable advantages. It is expected she will be ready for launching in about a month, but may not perhaps be placed in her destined element, until early in the spring.—*Leeds Mercury.*

The President, Steam Ship.—This splendid vessel, which has, for some time past, been building in Messrs. Curling and Young's yard, Limehouse, (the builders of the British Queen,) will be launched on Saturday next, the 7th December. The President is the largest ship in the world. The dimensions are as follow :

	Ft.	In.
Length (extreme).....	268	0
Ditto for measurement.....	230	0
Ditto of keel	220	0
Breadth.....	42	0
Ditto, including paddle boxes.....	64	0
Depth in the hold midships.....	23	6
Height of upper deck.....	7	6
Diameter of paddle wheel.....	21	0
Draught of water with cargo.....	17	0
Burden in tons (old measurement).....	1,921	57-94
Weight of engine, boiler, &c.....	500	tons
Power of engine.....	600	horse.

Thus it appears, that the President is 126 tons larger, and has 100 horse power more than the British Queen.

The Glasgow Iron steam ship "Royal George."—This beautiful vessel, belonging to the Glasgow and Liverpool Royal Steam Packet Company, is now on her second trip between this port and that from which she sails; and as another, and a new and splendid specimen of what can be accomplished by our Scottish competitors in steam navigation, she has attracted much and deserved admiration. She is the second iron steam ship produced by the same proprietary, the Royal Sovereign, placed on the station a few months ago, being the first, and also a crack, we may say a twin, vessel. It is very natural for common observers to suppose that we, of Liverpool, entertain some slight feeling of jealousy at these advancements of our northern countrymen, who some hundred years ago were perhaps a hundred years behind us in matters of science and nautical enterprise. If, however, such a feeling ever found harbor for a moment within us, it was of that nature which resolves itself into generous rivalry, and which hails every mutual improvement that may tend to the advancement of mutual intercourse and commerce as a benefit attained not only for Great Britain, but, through her for the vast regions to which extend the ramifications of her internal traffic and manufactures. It is scarcely possible to estimate the advantages derived by a country, even though circumscribed in extent, from the facility and rapidity of transit derived from the agency of 'steam.' Steam, is indeed the moving power of the day. It is rapidly approximating town to town, state to state, continent to continent. Its advantages are developed more peculiarly in 'coasting' than in 'ocean' navigation, surprising and admirable as are its achievements in the last. About twenty years ago, a voyage hence to Glasgow, along a coast of two hundred miles in extent, was an undertaking of such peril, and generally of such delay, by sailing craft, that few persons could be induced to undertake it. Now, steamers of a large size, capable of contending with adverse winds and waves, and fitted up in a manner to gratify, in accommodation those who would recline in the very lap of elegance and ease, perform the voyage with the regularity, and more than the speed of mail coaches, over the same extent of ground, and at a cost too immeasurably below that of travelling by land in former or in modern times.

The Royal George is of about 500 tons burthen. She is 180 feet in length; 200 feet from the figure head to the taffrail; 22 feet 6 inches in beam, or 46 feet over the paddle boxes. Her engines are of 120 horses power. The diameter of the cylinder is 61 inches, length of stroke 5 feet. These engines are beautiful highly finished pieces of machinery, and were manufactured by Messrs. Todd & Macgregor, Glasgow. The saloon or principal cabin, is a very spacious and magnificent apartment. The entrance from the deck is exceedingly well contrived, there being a door and flight of steps on either side of the vestibule or 'companion,' leading to the landing at the top of the main stairs, so that in stormy weather, the windward door may be closed. The 'architectural' visitor on descending may anticipate the general style of the whole. The panneling of the stair case is finely painted in rosewood. The banisters are of polished brass, the rails of polished rosewood, and all bespeak the old English or Elizabethan, in its massiest and purest fashion. The folding doors leading to the saloon

are of rosewood; admirable specimens of the massive gothic; the styles are finely moulded, and the pannels are projected into the alto relievo beyond them. The dark color of the rosewood is relieved by massy floreated gilt hinge work and other ornaments of the same material. On entering the cabin, the visitor cannot fail to be struck with admiration. The apartment is about forty feet in length, and about twenty two in width, occupying the whole breadth of the vessel. It is lighted by three windows of plate glass on each side, by the stern windows, and by the square dome or deck lights. The style is massy gothic; and the whole of the wood work, including the walls and the furniture, is of choice dark and variegated rosewood, as a substitute or rather improvement upon oak. Between the side windows there are inserted gothic pannels of frames, with raised mouldings and interior gilded frames, for the reception of pictures in *papier maché*, in proportion, but now fitted up with crimson drapery. The mouldings and other decorations, including the trusses that form knees or brackets on the top of the pilasters, between the windows and the pannels, in the angle formed by each pilaster and the roof beam that rests upon it, are beautifully carved in open work and richly gilded. Some idea may be formed of the very liberal expenditure bestowed on this apartment, when we state that the gilding alone of one of these trusses cost six guineas and a half. They are of two patterns, one of each being placed alternately, and have a fine effect. The cornicing and beading is also gilded. Across the stern windows there is a fine transparency, a view of Windsor Castle, with the royal residents and their visitants in the foreground. Sofas or ottomans surround the apartment, divided by massy carved rosewood arms or elbows. These are of great width, and the backs reach to half the height of the cabin, forming a semi-circle at the stern. They are cushioned in embossed crimson velvet of a peculiarly rich and appropriate fabric. The tables are also of rosewood, standing on massy single gothic pillars, and so contrived that though there is a space between, they may be elongated and form a 'festive board,' all around the room, in the form of a horse shoe. The chairs are in corresponding gothic style, of the choicest description. They are all solid rosewood, with cushioned seats and backs corresponding with the sofas. They probably weigh little short of 50lbs. and cost upwards of five guineas each. The roof is one of the most attractive portions of this beautiful saloon; between the beams it is decorated with tracery and graining most elaborately carved in alto. At the entrance there are two state rooms, one on each side, which narrow the saloon for a short distance from the door way. The architect has rendered this arrangement highly decorative. The roof formed between the two state rooms is of a semi-circular form. The door is in the centre, and on each side there is a sideboard of gothic design, richly carved in rosewood. Over these are mirrors, each of their perpendicular plates placed in concave position, with the segment formed by the wall where they are placed. The frames of these are of fine open gilded carved work. The doors of the two state rooms leading from the saloon, face the stern, and have been much admired. In the upper pannel of each there is a mirror with antique framework, surrounded and surmounted by gilded ornaments of exquisite design

and execution. The two sky-lights are glazed with stained glass; each pane, twenty in all, containing a separate portrait of a British monarch, surrounded by rich gothic decorations. These were executed by Mr. Cooper of Edinburgh, who has discovered a new and admirable process by which to stain glass, for which he has taken out a patent. On the whole we should say that this cabin is the most costly and magnificent we have yet seen, and that the whole as well as the vessel, her engines, (by Messrs. Todd & Macgregor,) and her general equipments, are an honor to her proprietors, to the port from which she sails; indeed, to the country to which she belongs.

The ladies' and gentlemen's state rooms are fitted up on a scale of corresponding elegance and comfort; but we have not room on this occasion, to notice them in detail.

The Royal George, Captain Cooke, is of a beautiful model. She is so well put together (being 'as strong as iron can make her') that no vibration is felt by the motion of her engines; and she has already proved herself the fastest boat on a station, second to none in the beauty and swiftness of its steamers. So much for iron *versus* wood.—*Liverpool Standard*.

NOTICES.

"*The School Library*,"—It is a legitimate duty of all public journals to notice such individual or associated efforts, as are best calculated to promote the object they profess to have in view, viz: the diffusion of useful knowledge. In this they as effectually accomplish their proposed purpose, as if they were to give in detail the particulars which those efforts produced. If, then, by calling the public attention to the means by which the people may obtain useful information, our desired object can be attained, we shall hope to commend ourselves to our readers by doing so whenever our limits deny us the opportunity to communicate the results of those means. Among the most important and efficient means to disseminate knowledge, *School Libraries* stand pre-eminent. They are to operate like a mighty lever, on the public mind, and their effect will be as powerful, and as clearly seen and felt, in elevating public sentiment and intellect, as any one of the mechanical powers in overcoming the resistance of inert matter. The great state of New-York—truly indeed, the empire state—was the first to apply this all-important power to mind; and so grand was the scheme and so noble the effort, that others speedily followed the splendid example and emulated her in the magnificent enterprise. Massachusetts, never behind any one of her sister states, in any thing which contributes to education, has commenced a series of works, under the title at the head of this notice, and which exhibits an array of talent, unequalled in this or any other country.

The Board of Education, under the auspices of which this galaxy of authors is shedding abroad a flood of light, unites a moral and intellectual force, no where else to be found. Already have numerous volumes, which, in matter and style, are incomparably superior to any other designed for a similar purpose, emanated from this source; and we cannot doubt that they will be adopted, wherever such libraries are required. To enumerate the eminent writers engaged in preparing these works, or to notice the merits which each published volume exhibits, the beautiful and perspicuous style in which they are executed, would require more space than we can now devote to these purposes. We can only refer to the works themselves, at the office, 126 Fulton st. where they are for sale, as we understand, for public or private libraries.

Journal of the Franklin Institute.—We take pleasure in calling the attention to our valued collaborateur in the cause of Science and Art. The work fully maintains its high character for useful, practical information, valuable tables, ingenious theories, lucid descriptions, and important communications. We cordially wish it a continuance of the success which has hitherto attended it, and we shall be pleased to assist in keeping its merits before the public.

LIST OF PATENTS GRANTED DECEMBER 1839.

Richard Walker, of Portsmouth, Rockingham Co. Virginia, improvement in the Framework Knitting Machine. Patented 5th December, 1839.

Benjamin F. Smith, of South Hadley, Massachusetts, improvement in the construction of Fire Arms. Patented December 5th, 1839.

Edward Tilghman, Philadelphia, improvement in the form of Railway Bars, and the mode of fastening the same. Patented December 5th, 1839.

Edward Clarke, Saugerties, New-York, machine for separating corroded from uncorroded lead in the manufacture of carbonate of lead, (the white lead of commerce,) called "Clarke's Parting Apparatus." Patented December 5th, 1839.

Nicholas Turbutt, Fredericktown, Maryland, apparatus for arresting the sparks which usually escape through the chimney of a locomotive or other engine, called "Turbutt's Spark Catcher." Patented December 7th, 1839.

John Price, Nashville, Tennessee, Cotton Press. Patented December 7th, 1839.

Abner R. Ring, Parma, New-York, "Franklin Cooking Stove." Patented December 12th, 1839.

Orson M. Allaben, Middletown, New-York, machine for fractures of the lower extremities, called an Apparatus for Fractures. Patented December 12th, 1839.

Benjamin Bosworth, Fayette Co., Kentucky, improvement in the Bedstead. Patented December 14th, 1839.

William Reynolds, of Camden, S. C. instrument for supporting the abdomen, back, and perinæum called "Reynold's Gerenteron, or Visceral Supporter." Patented December 14th, 1839.

Joseph Rodefer, of Cincinnati, Ohio, mode of constructing Secret Interlocking Joint Bolts, for fastening bedsteads, &c. Patented December 18th, 1839.

Cornelius Bergen, Brooklyn, New-York, Silk Loom. Patented December 18th, 1839.

William W. Townsend, Shoreham, Vermont, Cheese Press. Patented December 18th, 1839.

John Price, Nashville, Tennessee, apparatus for burning Pine Knots. Patented December 18th, 1839.

George Smith, of Philadelphia, Pennsylvania, Door and Window Shutter Safety Spring Bolt. Patented December 18th, 1839.

Samuel W. Foster, Scio, Michigan, Smut Machine. Patented December 21st, 1839.

- Abel Morrall*, Studley, Kingdom of Great Britain, improvement in making Needles. Patented 21st December, 1839.
- John P. Bakewell*, Pittsburgh, Pennsylvania, Self Acting Safety Valve, for preventing steam boilers from bursting. Patented December 21st, 1839.
- Frederick V. Barnard*, Philadelphia, Pennsylvania, making Portable Houses. Patented December 21st, 1839.
- Elisha Tolles*, Hartford, Connecticut, Metallic Suspension Wheel for carriages. Patented December 27th, 1839.
- Nathaniel Hebard*, Dorchester, Massachusetts, Machinery for Dressing the Pulp, used in the manufacture of paper. Patented December 27th, 1839.
- Britton M. Evans*, Lancaster, Pennsylvania, improved Rail Road Chair, to dispense with the use of wedges. Patented December 27th, 1839.
- Herrick Aiken*, Franklin, New Hampshire, Socket for Holding Tools. Patented December 27th, 1839.
- George D. Boyce*, West Wareham Massachusetts, Cooking Stove.— Patented December 27th, 1839.
- Herman Haupt*, York, Pennsylvania, Bridge Truss. Patented December 27th, 1839.
- William M. Hall*, Wallingford, Connecticut, Self-Protecting Bee Hive. Patented December 27th, 1839.
- Thomas Reaney*, of Philadelphia, Pennsylvania, Spark Arrester. Patented December 28th, 1839.
- Frederick P. Dimpfel*, New-York, Revolving Fan Wheel, or Blowing Apparatus for Furnaces, &c. Patented December 28th, 1839.
- Elisha Hale*, Newburgh, New-York, Umbrellas and Parasols. Patented December 28th, 1839.
- Horace Welles*, Hartford, Connecticut, Coal Sifter. Patented December 31st, 1839.
- Gerard Sickles*, Middletown, Connecticut, Reel Box, for winding tapes and lines. Patented December 31st, 1839.
- George S. Griggs*, Roxbury, Massachusetts, Self-Acting Safety Brake, for railways. Patented December 31st, 1839.
- Isaiah Jennings*, New-York, combination of ingredients to be used as a substitute for Oil, &c. Patented December 31st, 1839.
- George M. Johnson*, Port Deposit, Maryland, Hat Coloring Machine. Patented December, 31st, 1839.
- Lewis R. Palmer*, Maryland, Otsego Co. New-York, machine for Changing Hides from one vat to another, in the operation of Tanning. Patented December 31st, 1839.

Ebenezer Barrows, Mattaposett, Plymouth Co. Massachusetts, Kitchen Ranges for cooking. Patented December 31st, 1839.

Manasseh Andrews, of Bridgewater, and *James Sproat*, Taunton, Massachusetts, mode of relieving the Collar of a Circular Saw, used for sawing boards, &c. from the friction occasioned by the pressure of the article sawed, as it is separated from the block upon the collar of the saw. Patented December 31st, 1839.

Thomas J. Butler, Johnstown, Pennsylvania, mode of cutting seats, slots, or groves for keys in the bore of hubs of wheels, and in the axles of rail road cars, and carriages of various descriptions, &c. &c. Patented December 31st, 1839.

Benjamin D. Beecher, of Prospect, Connecticut, manner of constructing and propelling boats, &c. by steam or other power. Patented December 31st, 1839.

Samuel N. Purse, and *Martin Staley*, of Ashley, Missouri, machine for preserving the equilibrium, or trim, of steam boats. Patented December 31, 1839.

Silas Day, and *Samuel Hall*, New-York, improvement in Fire Arms. Patented December 31, 1839.

Nathan Freeman, Lowell, Massachusetts, improvement in Wool Carding Machines. Patented December 31st, 1839.

Jos. C. Vaughan, and *Frederick Leach*, of Tioga, New-York, machine for manufacturing lead pipe. Patented December 31st, 1839.

John G. Lothrop, Provincetown, Massachusetts, Cooking Stoves. Patented December 31st, 1839.

Henry Waterman, New-York, Machine for Cutting Nails. Patented, December 31st, 1839.

List of Patents granted from January 1st to 15th, 1840.

Samuel S. Allen, Miamisburgh, Ohio, Horse Power. Patented January 10th, 1840.

Edwin Eastlack, of Greenwich, New Jersey, mode of disengaging horses from carriages, when in the act of running away. Patented January 10th, 1840.

Benjamin Benson, Smyrna, Delaware, improvement in Silk Cocoones. Patented January 10th, 1840.

Peter Getz, of Lancaster, Pennsylvania, Steam Cooking Stove. Patented January 11th, 1840.

William W. Bergstresser, Harrisburgh, Pennsylvania, improvement in Wheels for Railroad Cars. Patented January 11th, 1840.

Charles C. P. Crosby, Brooklyn, New-York, Evaporating Kettles. Patented January 11th, 1840.

Samuel S. Allen, Miamisburgh, Ohio, machine for Husking and Hulling Corn. Patented January 15th, 1840.

Mathew W. King, New-York, improvement in wheels for Propelling Boats. Patented January 15th, 1840.

Aaron Ball, Caroline, New-York, machine for cleaning grain from smut; cooling, conveying, and bolting flour. Patented January 16th, 1840.

DESCRIPTION OF PATENTS.

Spark Catcher. By NICHOLAS TURBUTT.

This Spark Catcher consists of a circular grating, over which is placed an inverted funnel, whose smaller end is continued upward at a uniform diameter as high as the ordinary chimney, around which is placed a circular case resting on legs, on a circular horizontal plate fastened to the outside of the funnel; upon which plate is placed another circular case or rim, concentric with the others, but not touching them, open at the upper end. The middle case, surrounding the flue, is closed at the upper end, and open at the lower end; the plate which closes the upper end, however, is raised above the top of the flue sufficiently high to allow the smoke to pass over the top; it then descends along the space between the middle case and flue, passes under the lower end, and ascends between this case and the outer case or rim to the atmosphere, the sparks falling on the circular plate, from whence they are removed through a door in the same.

The claim is to the arrangement of the grate, inverted funnel, circular plate and rim around the same, in combination with the ordinary chimney and case for arresting sparks.

Improvement in the Franklin Cooking Stove. By ABNER R. RING.

This stove consists of a Franklin with a Cooking Stove attached to the same behind, into which the smoke and heat from the Franklin fireplace may be turned at pleasure, when culinary operations are desired to be performed, by having a part of the back of the Franklin to turn on an horizontal rod, passing through the sides thereof, by which a communication or draft is opened to the Cooking Stove, at the same time closing the front and opening the back part of the funnel of the Franklin, by means of a swinging damper, the smoke and heat being caused to pass down, in front of, under, and up behind and over a large square oven, and then through apertures in a sliding register behind the Franklin, and into the funnel which conveys it to the chimney. In passing over the oven it also passes under boilers in the top plate of the Cooking Stove. The smoke can also be directed immediately from the Franklin to the boilers, without passing under the oven by means of the registers; and should the heat not be sufficient for the operations of cooking, an extra fire can be made in the space over the oven and under the boilers, the smoke passing directly through the registers into the funnel. When the cooking apparatus is not used, the dampers

in the back of the Franklin and in the funnel are turned, which will cause the smoke to ascend in the Franklin in the usual manner.

The invention claimed consists in the combination of the damper in the back plate of the Franklin with the register plates or valves arranged and operating as described, by means of which the draft is carried down under the oven, and in connection therewith, the constructing the back plate of the boiler chamber with apertures, so as to admit of the draft passing under the boilers after it has circulated under the oven, and escaping in front through the apertures governed by the outer register into the main flue or double pipe.

Also the combination of the apertures in the back plate of the boiler chamber with the valves or registers, by means of which arrangement the inner register being closed, the boiler chamber may be employed as a chamber of combustion; the draft passing through the aforesaid apertures into the back flue formed by the back plate of the Franklin, and the front plate of the oven and boiler chamber, into the main flue or pipe.

Improvements in Supporters for the Abdomen, Perinæum, &c., called the Gerenteron. By WILLIAM REYNOLDS.

This improvement consists in making the front pad, or supporter of the abdomen, in two parts, united by broad straps and buckles, which can be let out as gestation progresses, without the necessity of procuring other pads to suit the size of the abdomen, during its progressive changes; which pads are united to the back pad by two curved springs passing over the hips in such manner as to impart to the apparatus a vertically lifting as well as an horizontal action; and also in making the back pad with a vertical hinge in the centre, that it may conform to any sized or shaped back, whether still or in action; and in making the lower part of the pad plate concave so as to preserve the spinal column from injury.

Likewise in constructing the pad for the support of the perinæum, with an elliptic spring in the centre, that shall be compressed into a small compass, and remove the hardness and inconvenience of the pad to the wearer in sitting down, which is experienced in the use of the common pad without such a spring.

Also in combining with the straps which attach the perinæum pad to the back and front pads, certain coiled springs for making the straps more elastic or yielding.

The invention claimed consists

1st. In constructing the back pad plate a little raised on each side of the centre, so as to form a recess on the under side that the spine may be safely lodged therein, in combination with the vertical hinge in the centre, permitting each side to fold down so as readily to adapt itself on each side of the spine to any shape of the back, as before described.

2d. The combination of the hip springs constructed and arranged as herein described, with the front and back pad, the whole being arranged and operating in the manner set forth.

3d. The mode of adjusting the hip springs by means of the clasps and pins on the front pads as described.

4th. The mode of adjusting the front pads so as to adapt them to any sized abdomen by the means described, or any other mode substantially the same.

5th. The construction of the pad for supporting the perinæum, with an elliptic spring in the centre as described.

Be it known that I, Samuel W. Foster, of Scio, in the county of Washtenaw, State of Michigan, have invented a new and useful improvement, in the machine for cleaning grain, called

"Foster's Improved Smut Machine."

which is described as follows :—

This machine is an improvement on Yates' Smut Machine, patented during the present year 1839.

The moving part of this machine is described as follows :

It consists of a vertical shaft about four feet long, and six inches in diameter, with a steel pointed gudgeon in the lower end, and a common cast iron gudgeon in the upper end; two arms are put through the shaft near the middle, and notched together and keyed tight; these arms are three feet and two inches long and twelve inches wide; but are notched in the lower side one inch and a half deep, extending from the centre towards each end eleven inches. These arms are made of plank, one inch and a half thick, and the upper side is cut away so as to be three quarters of an inch thinner than the lower side, the slanting side of the arm being brought to a plane surface. This slant on the arm is made on opposite sides of the shaft, so that each arm, when it strikes the wheat, will have a tendency to elevate it as well as to throw it horizontally forward. A circle of plank one inch and a half thick, the diameter of which is equal to the length of the notches cut out of the arms on the lower side, which circle is now nailed on to the under side of the arms. A circular rim of plank, two inches thick and eight inches wide, the diameter of which is equal to the whole length of the arm (38 inches) is nailed on to the lower sides of the arms. The slanting side of the arms (which first strike the grain) are covered with sheet iron, and the under side of the circle and rim mentioned are also covered with sheet iron, and the outer edge of the rim is also covered with sheet iron, and filled with small nails, driven in close together, and projecting from the surface of the iron about half an inch. There are three small pieces of wood nailed on to the bottom of the first mentioned circle, and against these are nailed small pieces of leather, in such a manner as to strike the grains of wheat, and prevent any of it from falling down around the shaft, the centrifugal motion throwing the grain from the centre toward the periphery. On the shaft about a foot from the lower end, is a whur, five inches thick and twelve inches diameter, around which is passed a band for propelling the machine.

The frame work, or immoveable part of the machine, is constructed as follows :—

There are six posts, four of them about four feet long, and two of them about five feet long, three inches by four; in the lower end of the

longest posts (which in the frame are opposite each other) there is a mortise in each an inch and an half by six inches; in these mortises rest the ends of a piece of timber on which stands the lower end of the shaft; in this timber is placed a cast iron box with a steel step in it to hold oil around the gudgeon. About two feet from the lower end of the posts there are six curved girts framed in, three inches square and seventeen and an half inches above these girts is the upper side of another tier of girts, two inches by three inches; on the lower girts is laid a circular floor of plank, two inches thick, with a hole in the centre, thirteen inches diameter. Around this hole on the upper side of the floor is fastened, a circular rim of plank, two inches thick, and four inches wide, the top of this rim is covered with sheet iron projecting one fourth of an inch over and beyond the periphery of the wooden rim to assist in preventing the wheat from flying down around the shaft.

Within this hole and around the outside of it is nailed a piece of leather, extending around and above the hole, three fourths of an inch; this piece of leather, and the last mentioned piece of sheet iron, and the small pieces of leather and wood nailed on to the moving part of the machine, together with the projection of the last mentioned rim of plank, and the cavity or countersink on the moving part or disc, to receive it effectually and prevent the wheat from wasting around the shaft. The floor, and the outside of the last mentioned rim, is covered with sheet iron, and driven full of nails projecting from the sheet iron about half an inch. Around the outside of the arms or wings is a covering of sheet iron nailed on to the inside of the posts seventeen and an half inches wide, and nailed to the inside of the upper and lower tier of curved girts. A covering is then put over the top of the arms or wings, resting on the upper tier of girts, made of inch boards, with sheet iron on the lower side, and filled with nails, driven in near together, and projecting down about half an inch. The wheat is let into the machine through an opening in the top cover, and is discharged at the bottom through a spout, which must be placed in the bottom of the machine, a little to the right or left from the spout through which the grain is admitted, according as the machine runs to the right or left. A cap is placed on the top of the two long posts in which is fixed a wooded box for the upper gudgeon to run in.

In operating with this machine the wings not only throw the grain against the inside of the circular case, in breaking the smut from the grain, but they also drive the dust through the apertures in the circular case, whilst the clean grain falls down through the spout below.

The invention claimed and desired to be secured, by letters patent, consists in constructing the floor of the cylinder with a rim or collar around the shaft, for the purpose of preventing the grain from passing out between the shaft and cylinder, and, in combination therewith, adapting the disc to the aforesaid rim or collar, by countersinking it in the manner herein described, by which means a trough or channel is formed for the grain, in which it is retained and operated upon with more effect than if the bottom of the cylinder were a perfect plane.

Also the arrangement of the strips of wood and pieces of leather

on the under side of the disc for throwing the grain from the centre toward the periphery of the disc, as described.

SAMUEL W. FOSTER.

EDWARD MAHER,
WILLIAM P. ELLIOTT, } *Witnesses.*

Mode of constructing Portable Houses for Transportation.

BY FREDERICK S. BARNARD.

This improvement consists in preparing the sides, ends, floors, roof, &c. of the house in single pieces, fitted and ready for putting up in any situation desired. The sides and ends are composed of boards planed, tongued and grooved and fastened together by cross-pieces to which they are nailed, leaving suitable openings for the doors and windows. The floors and roof are made in a similar manner. The whole is then painted. It is proposed by the Patentee to make them by machinery in the Atlantic cities, and transport them by our canals, lakes and rivers to the west, for the use of emigrants, where mechanics are difficult to be procured; the parts being so constructed that any one, whether a mechanic or farmer, or other person, can put them together and erect for himself and family a dwelling in a few hours, possessing convenience, strength and beauty.

The invention claimed, consists in the mode of constructing portable buildings, that is to say in completing the sides, ends, floors, roofs, &c. separately and completely finished, to be put together, as herein described, without the aid of a regular mechanic.

Polishing the Eyes of Needles. BY A. MORRALL.

This invention consists in stringing the needles on rods, covered with emery, or on small round files, arranged in a revolving wheel which is made to receive a rotary motion, which imparts to the needles a rotary as well as a vibratory movement on the files, by which the eyes are made smooth.

Tool Holder. BY HERRICK AIKEN.

This improvement consists in making a gripe in two or more parts, between which the tool is held, made larger at one end than at the other, leaving a screw cut on the smaller end, which screws into a nut secured at the bottom of a socket in the ordinary handle, and conical at the larger end, so that by screwing the gripe into the nut, the conical end is drawn against the sides of the socket and forced to gripe and hold the tool firmly.

The invention claimed, consists in making the gripe with one end conical, and fitted to the outer end of the socket, and the other end provided with a screw fitted to a female screw in the other end of the socket, secured in the handle in the manner and for the purpose described; and this is claimed whether the gripe be made in two or more pieces, or in one piece and slit.

Coal Sifter. BY HORACE WELLS.

This improvement consists in providing a case a little wider than the ash draw, about one third longer and higher, with a screen inside extending about two thirds its length, and placed above the bottom about the depth of the draw, or a little more, composed of wire, or perforated sheet iron. This case is placed in a horizontal position, when the draw, filled with ashes and coals, is inserted. It is then turned over and shaken, which causes the ashes to pass through the screen whilst the coals are held in the draw. The case is then raised to an angle of about fifty degrees, which causes the ashes to slide down to the end of the case; the case is then turned over and the pan drawn out with the sifted coal. The ashes are discharged by resting the open end of the case upon the floor, and elevating the other end.

The claim is to the combination of the box or case, with the draw or ash pan.

Reel Box, for winding lines, &c. BY G. SICKLES.

This consists of a tin cylinder, on which the line is to be wound, turned by a crank or handle attached to it, in a hollow cylindrical case, of a diameter sufficient to contain the reel and cord wound thereon. It operates on the same principle as the common tape winding apparatus used for measuring.

Machine for handling or shifting Hides from one vat to another, and expressing the exhausted liquors therefrom. BY LEWIS R. PALMER.

This machine consists of two posts mortised, and tenoned, and braced into two horizontal parallel sills; between which posts turns an horizontal cylinder, by a crank; upon which cylinder turn a number of rollers on an axle lying parallel with the axis of the cylinder, passed through holes in the centres of the rollers and through the posts; which holes are made larger in diameter than the diameter of the axle passing through them, in order to allow the rollers to rise and fall in conforming to the inequalities of the surfaces of the hides passed between said rollers and the cylinder. The operation of the machine is as follows. Pass the end of the hide between the cylinder and rollers, turn the cylinder, this will draw the hide from the vat on one side, and drop it into another vat on the other side, the rollers (being made sufficiently heavy) serving to press the exhausted liquor from the hide, and thus prepare it to receive a fresh liquor from another vat into which the hide is delivered on the other side of the machine.

The invention claimed consists in the combination and arrangement of the parallel loose revolving rollers with the revolving cylinder placed below the same, between which the hides are drawn for pressing the exhausted liquors therefrom in the process of tanning leather.

Improvement in Fire Arms. BY DAY & HALL.

The charge is contained in a metallic thimble, primed or capped, and inserted at the breech of the piece in the manner of Fay's patented gun, with some slight improvements.

Be it known that I, EDWIN EASTLACK, of the township of Greenwich, in the county of Cumberland, and state of New Jersey, have invented a new and useful improvement in Harness and Carriages, to prevent accidents from the running away of the horses, called

"The improved Safety Harness and Carriage,"

which is described as follows :

The nature of my invention consists in so constructing the traces, each one being in two parts connected together by spring bolts, whilst the horse is drawing the vehicle at an ordinary speed, and held thus by a clasp, which clasp (when the horse runs away) is drawn back by the driver by means of a cord attached to it leading inside the carriage and laid hold of by him, which suffers the springbolts to fly asunder from the traces, which are thus separated, leaving the parts attached to the swingle-tree behind with the carriage, whilst the horse takes with him the rest of the harness ; the tugs being so constructed with metallic plates, pin and roller, as to slip over the shafts or thills without any impediment, and also in having a pinion attached to the perch working into a cogged segment fastened to the forward axle-tree, which pinion is turned by a lever inside the carriage, for the purpose of steering the carriage after the horse is disengaged therefrom.

And, likewise, in the construction and application of a double clamp break, which is made to embrace the hubs by means of a combination of levers and rods placed under the carriage body, and operated by the driver by means of one of the levers which extends inside the carriage, for the purpose of gradually arresting the motion of the carriage, also, in constructing the ends of the swingle-trees with spring-bolts, cords and pulleys for disengaging the traces from the ends thereof, instead of separating the traces as before mentioned.

The disengaging apparatus.—The traces are made in the following manner : each trace is made in two parts ; one part being of greater length than the other part ; one end of the longer part is attached to the hame in the usual manner, and is called the hame trace ; to the other end is secured a metallic bale, having one of its sides open to admit one end of the short part of the trace called the swingle-tree trace, through which and the sides of said bale are made perforations corresponding with each other when the hame trace is inserted, and into which bale are inserted two pins fastened to the ends of two springs, secured to the end of the short part of the trace by rivets passing through the springs and trace and the swingle-tree part of the trace, and when thus inserted in the bale and the springs contracted so as to cause the pins to pass through them, are held by a rectangular sliding clasp attached to the end of a cord leading inside of the carriage for the driver to lay hold of and draw by, when the clasp is to be removed for disengaging the parts of the trace. The other end of the short part of the trace is attached to the end of the swingle-tree in the usual manner. The other trace on the opposite side being similarly constructed and applied, need not therefore be described. A description of one of them answering for the other.

The short reins are held on the saddle hook, by means of a spring

fastened to the saddle and pressing against the hook which keeps them from slipping off.

The tug irons are made each from a flat plate in an oval shape, forming a loop attached to the lower end of the tug strap; they embrace the shafts or thills. In this curved plate is placed a roller, turning on a pin passing through the sides of said oval or curved loop; this roller works against the shaft hook by which the carriage is held back; the breeching being attached to the tug irons by a strap leading from said tug irons to the breeching ring. By this construction of tug irons, the harness is at once liberated from the thills or shafts as soon as the parts of the traces are separated by drawing the clasp from the springs.

The steering apparatus.—The cogged segment for steering or guiding the carriage is secured to the forward axle-tree, by letting both its ends into the same, the cogs being toward the hind axle-tree works, below the perch. The pinion which works into said cogged segment is also placed below the perch, its axle passing vertically through the same, to which is fastened an horizontal arm, to this a vertical rod, and to the upper end of this an horizontal handle for turning the cog wheel, in steering or guiding the carriage when the horse is liberated.

Apparatus for arresting the motion of the carriage.—The double clamp break for arresting the motion of the carriage consists of two levers moving on fulcra, on one side of the hind axle-tree, to the short end of which levers segment collars or semicircular rings are fastened, which partly embrace the hind hubs, and to the long ends of said levers which are connected together by a moveable joint, is attached a horizontal rod moving vertically over the perch. It turns up vertically, and passes through the bottom of the carriage to which a handle is fastened for moving it. On the opposite side of the hind axle-tree, and lying parallel with it, is placed on a bar moving in mortises, in two horizontal supports and guides inserted horizontally into the axle-tree, which bar is attached to, and moves with, the levers in the same direction, by means of links which connect them together, and to the ends of said bar are fastened two segments or semi-circular collars, which also partly embrace the hubs on the opposite side, are designed to accomplish the same purpose as those just mentioned; namely, to produce friction on the hubs for stopping the motion of the carriage.

Operation.—When the horse runs away, the driver pulls the cord, which draws the clasp from the springs, which instantly fly asunder in extending themselves, drawing the bolts or pins from the end of the traces, the cord being branched so as to move both clasps at the same time; the traces being thus separated, the driver throws the reins out of the carriage, which are carried off by the horse, along with all the harness except the short pieces of the traces which remain on the swingle-tree, with the springs, clasps, and cord attached to them.

The shafts being held up by suitable straps or by the driver holding the cord, and the carriage continuing to move onward from its momentum, must be guided by the driver, which is done by his laying hold of the handle and turning the pinion, which moves the segment and this the forward axle-tree, and thus guides or steers the carriage.

He then gradually stops its motion by laying hold of the handle of the brake, and, moving it vertically, moves the long ends of the levers

in the same direction, and the short ends in a contrary direction or toward the axle-tree, causing the segment collars to partly embrace the hubs and produce friction thereon. At the same time the segment collars on the opposite side are brought hard against the hubs by means of their connection with said levers by the parallel bar and links, and thus the friction on the hind hubs is increased to such a degree as to gradually arrest the motion of the carriage at the pleasure of the driver.

The swingle-tree may be so constructed and used as to effect the object of suddenly disengaging the horse from the carriage, in the act of running away, instead of dividing the traces, the horse carrying away with him both traces. To effect this object, the swingle-tree must be constructed with a sliding bolt at each end, to which bolt the trace is hooked; said sliding bolt is held in an extended position by a spiral spring surrounding it, the outer end of said bolt passing through apertures in a metallic box fastened on the end of the swingle-tree, for strengthening it, and for preventing the traces slipping off whilst drawing the carriage, and to the inner end of the bolt is attached a cord, passing round a pulley in the swingle-tree and running thence to the inside of the carriage near the driver; the other end of the swingle-tree is similarly provided with a sliding bolt, spring, cord, and pulley, which cord after passing over the pulley unites with the first mentioned cord, so that when the main branch is pulled by the driver, both bolts are drawn at the same time toward each other, and both traces disengaged simultaneously, and both spiral springs contracted, which as soon as the cord is again loosened, extend themselves by the exertion of the contracted springs, to extend themselves, thus driving the bolt out again ready to receive and hold the ends of the traces, which must be hooked over the bolts by hand. The outer plate of the metallic box, into which the end of the bolt enters, not only serves to prevent the bolt from bending or breaking, but it also prevents the traces from slipping off until the bolt is drawn therefrom.

What I claim as my invention, and which I desire to secure by letters patent, consists:

1. The combination of the spring bolts, bales, clasps, and cord, with the divided traces for disengaging a horse in the act of running away from a carriage as before described.

2. The iron tug in combination with the roller, as herein described to prevent the shafts from hanging in the tugs when the horse is liberated.

3. The combination and arrangement of the levers, rods, and semi-circular collars, for gradually arresting the motion of the carriage in the manner herein set forth; the *principle*, however, of arresting carriages by means of brakes applied to the hubs, is not claimed.

4. The combined sliding bolts, spiral springs, cords, and pulleys in combination with the swingle-tree for disengaging the traces therefrom, as described.

EDWIN EASTLACK.

Improvement in the Silk Cocoonery. BY B. BENSON.

This improvement consists in making use of an endless apron, passed under the hurdles and over rollers, in such a manner that by turning

the rollers the apron is moved under all the hurdles at the same time and discharges the filth at the ends of the hurdle frame. It is an improvement on Gray's patent.

Be it known, that I, AARON BULL, of Caroline, Tompkins County, state of New-York, have invented a new and useful *machine for cleaning smut from grain, elevating grain, flour, &c. and cooling flour*, which is described as follows:

This machine when used as a smut machine consists of an inclined hollow trunk of suitable length, breadth, and height, closed at both ends; the top perforated with a number of oblong apertures for the escape of smut and dirt, and for the admission of the grain; over one of which openings at the lower end the hopper is placed. On the bottom of the trunk are arranged a number of inclined planes at suitable distances apart, inclined at an angle of about ten or fifteen degrees with the bottom, and extending nearly to the top, and then turning down and back in a curved line, so as to form a concave for a revolving fan to turn in.

Under the hopper, and also at the elevated end of each inclined plane, except the upper one, is placed a revolving fan, the axles of which extend horizontally through the sides of the trunk, sufficiently far to receive pulleys for bands leading from the driving power (manual, horse, or steam) by which they are turned.

The upper inclined plane has no fan, but there is an opening in the bottom of the trunk at the lower extremity of the upper concave, through which opening the cleaned grain descends into a spout placed below it, which conducts it wherever desired. The upper end of the trunk, when of sufficient length to prevent the current of air driving the grain out, may be left open. The apertures in the top are provided with slides for closing or opening them at pleasure, being left open when used as a smut machine, and closed when used as a flour cooler.

In cleaning smut from grain, the grain is put into the hopper from whence it descends to the trunk; it is there met by the wings of the first fan, carried round and driven along the trunk until it meets the first inclined plane, against which it is driven with violence, which breaks the smut from it and is driven out of the trunk through the aperture in the top, whilst the grain falls over the ends of the inclined plane on to the second wheel, which is sheltered from the current of the first wheel by the rising of the inclined plane; the second wheel drives the grain against the second inclined plane, where the grain is treated in a similar manner, and so on until thoroughly cleaned, when it falls over the end of the last inclined plane and passes through the aperture in the bottom to the spout, which conducts it away to any place desired.

For simply conveying grain the apertures in the top may be closed by the slides, and the elevated end of the trunk be left open.

In both operations the machine should be placed in an inclined position, say at an angle of about ten or fifteen degrees with the horizon. It may, however, be placed in a horizontal position for some purposes.

In using the machine for cooling flour, preparatory to bolting it, the flour should be conducted from the stones, or other place by a spout,

into the trunk through an aperture in the top and thence driven into the bolt by the revolving fan. The bolt is made like others in use; also the grinding stones. The inclined planes and second fan are omitted, and the openings closed. The flour may be partially bolted by means of this machine, in a large close room by means of the current of air driving the finer flour out at the end of the trunk, and sending it to a greater distance therefrom, whilst the coarser flour being the heaviest will settle sooner and near the end of the trunk, and thus the flour may be partially bolted without the revolving bolt, in which case the apertures in the top, and the apertures in the bottom must be closed and the end left open.

When the machine is used for scouring wheat, the trunk must be made long enough to prevent the current of air from driving the grain out at the end of the trunk; the grain being made to fall over the last inclined plane above, and pass out at the opening in the bottom of the trunk.

What I claim as my invention, and desire to secure by letters patent, is the before described mode of cleaning, scouring, and conveying grain, and cooling, bolting and conveying flour by a current of air produced by revolving fans, arranged in an horizontal or inclined trunk, containing inclined planes, for breaking the smut, and sheltering the forward wheels from the current of air and apertures for the escape of the smut, and apertures for the passage of the grain, flour, &c. as described; the current of air being produced in the manner above described, or in any other mode substantially the same.

AARON BULL.

ED. MAHER, }
CALVIN BETTS, } *Witnesses.*

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No. 2.

NEW-YORK, MARCH, 1840.

VOL. I.

GEOLOGICAL REPORTS.

(CONTINUED.)

In our last we gave the report as far as the survey has extended, on this important and interesting subject, for the State of New York ; we now proceed, and shall go through the different states in succession as quickly and faithfully as the matter and the actual progress will permit.

MAINE.

The Geological Survey of the State of Maine, is in charge of *Dr. Charles T. Jackson*, of Boston.

The first report was published in 1837 ; it contains one hundred and twenty seven pages, and treats of Topographical and Economical Geology, accompanied by an atlas of twenty-four plates, with many wood cuts in the body of the report.

The second report was made in 1838, containing one hundred and sixty-eight pages. Under the heads of Topographical, Economical, and Agricultural Geology, we have an interesting and valuable account of the granite, limestone, roofing slate, and iron ores, of Maine. Analyses are given of soils, and other matters of importance to agriculture, illustrated by numerous engravings on wood.

The third annual report was published in 1839. It contains two hundred and seventy-six pages, and is illustrated by numerous wood cuts. Divided into General Geology, and Agri-

cultural Geology. It is a well written report, containing much useful information upon limestones, roofing slates, analyses of soils, &c. followed by a catalogue of the specimens collected.

MASSACHUSETTS.

The Geological Survey of this State was performed by *Professor Edward Hitchcock*, during the years 1830–31. The full report was published by the state in 1833, and is entitled, “Report on the Geology, Mineralogy, Botany, and Zoology of Massachusetts.” This report, which is of seven hundred pages, with an atlas of plates, presents a full account of the various rocks and minerals of the state, with much information of an useful and practical nature, and a catalogue of the same; followed by a list of the plants of Massachusetts, and also lists of the various subjects of the zoological department, viz: birds, reptiles, fishes, shells, crustacea, spiders, insects. This is a valuable report, in consequence of the many useful and interesting facts it contains; it reflects honor upon the state which authorized it, and upon the individual to whom it was given in charge.

The legislature of Massachusetts subsequently ordered a re-survey of the state, which was also performed by *Professor Hitchcock*. We have not read this second report; but there is a notice of it by *Professor C. U. Shepard*, in vol. 36 of *Silliman's Journal*, for July, 1839. It is said to contain much valuable information upon soils, manures, and other matters relating to agriculture, and is referred to as a valuable work.

An agricultural survey of Massachusetts was also ordered by the legislature, and is now in progress. The first report, of one hundred and thirty-nine pages, was made in 1838, by *Henry Colman*.

Massachusetts was the first state in the union which performed a complete geological, botanical, and zoological survey. North Carolina, as early as 1824 had ordered a geological survey.

CONNECTICUT.

The geological survey of Connecticut was given in charge to *Professor C. U. Shepard* and *Dr. Percival*. In 1837, Professor Shepard presented a report upon the economical mineral re-

sources, and scientific mineralogy of the state. The first part of this report contains much useful information upon iron ores, limestones, building materials, and other rocks which occur in this state; the latter part of the report is considered by Professor Silliman to be too scientific. *See notice of this report in Silliman's Journal, vol. 23, No. 1, for October 1837.* The geological report from Dr. Percival we have not seen, and are not aware that it has been published.

NEW JERSEY.

The geological survey of this state was made by *Professor Henry D. Rogers*, of Philadelphia, during the years 1835-36-37. The first report was made to the legislature in February 1836, and contains one hundred and eighty-eight pages, and several sections. This report gives a full account of the marl region of New Jersey, and of other valuable and useful minerals, especially limestones, and ores of iron, zinc, and copper. The survey was continued and completed in 1838, but we have not seen the final report.

PENNSYLVANIA.

The geological survey of Pennsylvania, has been conducted by *Professor Henry D. Rogers*, of Philadelphia, who has made three reports to the legislature.

The first report, which was made in December 1836, consists of twenty-two pages, and is of a preliminary nature.

The second report was made in February 1838, and contains ninety-three pages. It affords a description of the rocks of Pennsylvania, with a tabular arrangement of the same. The rocks are not named, but numbered, beginning with the lowest fossiliferous or sedimentary rock, which is a sandstone, and is called No. I. No. II is a limestone, and is the same as the "Trenton limestone," of the New-York geologists. The anthracite coal districts are described as No. XIII. The rocks of Pennsylvania as high as Nos. VIII and IX, are identical with, and doubtless in most instances a continuation of the rocks in the southern and western counties of New-York.

The third report was made in February, 1839. It contains one hundred and nineteen pages, and treats chiefly of the exten-

sive coal fields of Pennsylvania. Professor Rogers has decided that the bituminous coal and anthracite of Pennsylvania both occur in the same rocks, or in rocks of the same age. For the purposes of this survey, the state is divided into six geological districts, and Professor Rogers has nine geological and two chemical assistants. Pennsylvania is rich in coal, iron, salt, and marble.

MARYLAND.

We have seen but one report from this state, entitled "Report on the New Map of Maryland, 1836." This pamphlet, of one hundred and four pages, contains a report by the geologist *T. J. Ducatel*, upon the geology of some of the counties of the marl region, and also upon the coal region of the state, especially near Frostburg. This coal field is described as covering an area of two hundred square miles. The report is accompanied by four maps and sections.

A report from the engineer, *J. H. Alexander*, referring to canals and roads, with a map, concludes the pamphlet. It refers to several preceding reports, and we understand that the survey is still in progress.

VIRGINIA.

The geological survey of Virginia is conducted by *Professor William B. Rogers*, of the University of Virginia.

The first report, of thirty pages, was made in January 1837; it treats generally of the marl region near the coast, of the gold belt and other rocks east of the Blue Ridge, and of the limestone, plaster, salt springs, &c. west of the Ridge.

The second report, of fifty-seven pages, was made in February 1838. It contains farther remarks upon the marl region, and describes the rocks west of the Blue Ridge, which are numbered to correspond with those of Pennsylvania, from I to XII. Limestones, both common and hydraulic, iron ores, salt, and plaster, occur in these rocks.

The third geological report was made April 2d, 1839. It forms legislative document No. 56, and contains thirty-two pages. This report describes the Appalachian region, which consists of slates, limestones, and sandstones, and is rich in

iron ores; also the valley of Virginia, which consists chiefly of limestone, and contains the natural bridge, and Weyer's cave, two celebrated wonders of nature. Likewise, a description of some of the Virginia coal fields, and analyses of limestones and iron ores.

The reports upon Virginia, are written in a pleasing style, and convey much interesting information respecting the mineral resources of the state. Virginia is rich in iron, salt, plaster, and coal.

NORTH CAROLINA.

The geological survey of North Carolina, was made by *Professor Denison Olmstead*, in 1824-25, by authority of the state. This is the first survey of the kind that was made in the United States. The report is published in *Silliman's Journal*, vol. 14, 1828.

Professor Elisha Mitchill made a geological examination of the gold region of North Carolina, the report of which is also contained in *Silliman's Journal*, vol. 16, 1829.

TENNESSEE.

The geological survey of Tennessee is in the charge of *Professor G. Troost*, of Nashville.

We have seen only the fourth report of Dr. Troost, Oct. 1837, in thirty-seven pages. It contains a short general treatise on geology, and an examination of the Ocoee district, with a map, and a list of fossils.

KENTUCKY.

In 1837, *Professor W. W. Mather* was appointed, and made a geological reconnoissance of this state. We believe that nothing further has been done.

OHIO.

The geological survey of Ohio has been conducted under the superintendence of *Professor W. W. Mather*.

The first annual reports were made to the legislature, January 17th, 1838, and contain one hundred and thirty-four pages. The several papers were as follows:

Report from *W. W. Mather*, principal geologist, upon general and economical geology.

Report of *Dr. S. P. Hildreth*, first assistant geologist and Palæontologist, upon some members of the coal series, and upon salines.

Report of *Dr. J. P. Kirtland*, second assistant geologist, upon zoology and botany.

Report of *Professor C. Briggs, Jr.* fourth geological assistant, upon the geology of the district between the waters of Scioto and Hockhocking rivers, especially limestones, coal, and iron ores.

Report of *Col. Charles Whittlesey*, topographer to the survey, upon topography, with a map and sections.

See a review of the first annual report upon Ohio, in Silliman's Journal, vol. 24, No. 2, for July 1828.

The second annual reports were made to the legislature in December 1838. They form a large pamphlet of two hundred and eighty-six pages, and contain a very interesting account of the mineral wealth of Ohio. The several papers are as follows :

Report of *W. W. Mather*, principal geologist, upon economical geology, coal, analyses of soils, iron ores, &c.

Report of *C. Whittlesey*, topographer, upon the dip of strata, variation of the needles, tides, &c. with two maps.

Report of *Col. J. W. Foster*, assistant geologist, upon the counties of Muskingum, Licking, and Franklin. He adopts the following arrangement: alluvium, tertiary, coal-measures, fine grained sandstone, shale, carboniferous limestone. With a section.

Report of *C. Briggs, Jr.* assistant geologist, upon the counties of Wood, Crawford, Athens, Hocking, and Tuscarawas. With a section.

Report of *Professor J. P. Kirtland*, assistant geologist, upon zoology, with a tabular view of the mammalia, birds, reptiles, fishes, testacea, and crustacea, of Ohio.

Report of *Professor John Locke*, assistant geologist, upon the south west part of Ohio, with sections, maps, and several plates of fossils.

The geological survey of Ohio, is for the present suspended, the legislature of 1838 not having made any appropriation for its continuance.

INDIANA.

Dr. David Dale Owen, was engaged in 1837, in a geological reconnoissance of this state, and made a report to the legislature, of thirty-four pages. We believe that no farther progress has been made in this matter. The western part of Indiana is said to be rich in coal.

MICHIGAN.

The geological survey of Michigan is in the charge of *Dr. Douglass Houghton*. We have seen his report for 1837. Michigan contains coal, gypsum, and salt springs, which latter, however, appear to be rather weak. We believe the survey of this state is still in progress.

[For the American Repertory.]

MANUFACTURE OF WHITE LEAD,

OR CARBONATE OF LEAD.

The subject is one of great interest, as well in reference to the extensive use of the article as a beautiful and cheap pigment, as to the health of the workmen engaged in the process of making it.

The conversion of the metal is brought about by various methods, differing in different countries or places, according to the fastidious prescriptions of fancy or custom. Nevertheless, by far the greatest proportion of white lead is made by exposing sheets of metallic lead, in earthen pots to the action of the vapor of vinegar, atmospheric air, and carbonic acid gas, produced by the decomposition of an inhumating material in which the pots are imbedded, (usually spent tan, or horse litter.) The pots used are of different sizes, and contain from $2\frac{1}{2}$ to 12lbs. according to the form in which it is exposed, some preferring it in a gridiron form to that of sheets.

The sheets of lead are cast expeditiously on pans of rough sheet iron, about $2\frac{1}{2}$ feet long and 6 inches broad, which, for the purpose of confining the fused metal, are furnished with a rim on both sides, and at the end to which the *handle* is attached. The workman places this *pan* in nearly a horizontal direction, and

with one end resting on the *casting kettle*, a *ladleful* of the fused metal is poured upon it; it is then quickly raised, so as to give the *pan* a declination of 10° or 15° towards the *kettle*. In this way a thin sheet of lead will remain on the *pan*, which is then removed. This operation is repeated three or four times, when the heated *pan* is exchanged for a cold one. A man can readily cast two or three tons of lead in a day. The griddle forms are cast in open moulds placed on a table. The sheets of lead are convoluted so as not to touch, and placed in earthen pots which have been previously supplied with vinegar. These pots are deposited in layers, one over the other, and are confined by boards in a wooden frame, being wholly surrounded and divided between the layers with horse litter or spent tan. The pots when placed are usually first covered with a layer or two of sheet lead and then with boards, so as to keep the litter or tan from the lead. The decomposition of the embedding material soon commences, when carbonic acid and heat are evolved, the vinegar is volatilized, and the lead is converted to a carbonate. The time employed for converting the metal varies from two to four months, according to the season or temperature. Some portions, and not unfrequently one half, of the lead remains unchanged, which is cast over, and re-exposed as above described. A small portion of acetate of lead is formed; this is removed by washing, or decomposed with the carbonate of potash, in the subsequent process of manufacture.

The greatest portion of white lead used is now made in this manner, and, so far as we have any knowledge of the subject, has been, from time immemorial. In England and Holland, no other method has been practised, until quite recently. In France, Germany, and in the United States, other modes of manufacture are practised, and with what success we shall presently show; but, before doing so, we think it proper to notice a few of the many attempts which have been made to modify it, but which have proved abortive.

It appears by the Repertory of Arts, second series, vol. 13, pp. 244, London, that Edward Moore Noble, of Birmingham, England, obtained letters patent on the 23d of January 1808, for making white lead by a new process. We shall use the inven-

tor's own language, as far as we can, in giving a brief account of it. "I take lead, which I prefer to be in thin plates, or small pieces, and place it in a vessel that has a small communication with the atmosphere; to this I add so much acetous acid or vinegar, or a solution of acetate of lead, or of both, that the lead may not be wholly, but only partially covered in the liquor. I then transfer into the vessel a mixture of carbonic acid gas, and oxygen gas, or atmospheric air, or a mixture of all three, and I frequently agitate the mixture in order to make the liquor pass over and act upon the lead, and that the carbonate of lead when formed may be removed from the surface of the metal, and a fresh surface thereof may be exposed. Or, instead of the lead in a metallic state, I take litharge, or an oxide of lead containing the proportions of oxygen that will enable it to unite with the acetic acid; and to this I add either acetous acid, or a solution of acetate of lead, or both, taking care that the quantity of oxide of lead, be at least sufficient to saturate the acid. I then transmit into, through, or upon the mixture, carbonic acid gas, either in a state of purity, or mixed with atmospheric air, with oxygen gas, or with any other gas that will not injure the process, and I find it expedient, frequently to agitate the mixture, to facilitate the union of the carbonic acid gas, with the oxide of lead. Which ever process I make use of, a white substance is precipitated, which is white lead."

On the 26th August, 1808, about seven and a half months after the patent had been granted to Mr. Noble, in England, the French government issued a brevet for five years to M. M. Lescure & Brechez, of Pontois, for making white lead. Their specification is described at length, in the *4th vol. of the Repertory of Arts*, p. 125 et seq. London, 1829; but as more brief and intelligible, we quote a description of it from *Gray's "Operative Chemist," second edition-* p. 626, London.

"In France a solution of lead is first prepared by adding at least 174 pounds of finely ground litharge to 65 pounds of pyroligneous acid, of such strength that $22\frac{1}{2}$ grains of this acid may saturate 25 grains of well crystalized subcarbonate of soda; fifteen or twenty times as much water is usually added. The whole is left for a short time, and the clear

solution being poured off, some fresh acid and water is poured on the sediment, to take up any oxide that might have escaped the action of the first parcel."

"The clear solution decanted off, the residuum is run into large but shallow covered cisterns, and carbonic acid gas is passed into the liquid contained in these cisterns, by a large number of pipes.

"This carbonic acid gas is procured by the burning of charcoal in a close stove, and passing the burnt air into the liquor. When no more settling appears to be formed, the whole is passed into a deep cistern, and left there for some hours, when the liquid part is poured off, in order to be combined again with more litharge, some fresh acid being also added."

Thus formed, it is to be well washed and dried, when it is the article of commerce, known in France as the "Clichy white lead," from the name of the place where it is chiefly manufactured.

There is no difference in the quality of white lead made by the process of Noble, and that of Lescure & Brechez; they are in fact the same in principle, but differ in detail sufficiently to entitle them to the protection of their respective governments; but the credit of first discovery, if any be due, belongs unquestionably to Noble.

White lead made in this way is, speaking technically, very defective in body, or in other words, it has not the same degree of opacity as that which is made in earthen pots, as before described; three, four, or five coverings of the former being scarcely equal to one of the latter. The cause of this difference has not been determined; but it is highly probable that it is a bi-carbonate, or contains too much carbonic acid to make its use economical. Attempts have been made to manufacture white lead by this process in the United States; but, from the objections above stated, a market could not be found for it, and the manufacture has therefore been abandoned.

In France, the only country in which it is used to any considerable extent, it is understood that its manufacture is patronized by government. It is a beautiful paint, but, mixed with oil, is diaphonous, and hence is not likely to come into general use, except in very delicate paintings.

“THE GERMAN WHITE LEAD” is chiefly manufactured from the lead of Bleyberg in Corinthia, on account of its purity. The lead is cast into sheets as before described. Instead of pots, boxes five feet long, one foot broad, and about ten inches deep are used; the lower part of the boxes is pitched about an inch high; the upper part has sticks placed across. The acid mixture poured into each box is in some manufactories made of a gallon each of vinegar and wine lees; in others of twenty pints of wine lees, eight and a half pints of vinegar, and one pound of pearlash; the vinegar is usually made of crab apples and water. The leaves of blue lead being trimmed to a proper size, are doubled and hung over the sticks in the upper part of the box so as neither to touch each other, the sides of the box, nor the acid liquor; a cover is then put on, and if a dung heat be used, or the mixture contain pearlash, the joints are carefully closed with paper pasted over them. The more usual mode is to dispose the boxes in a large room heated by stoves to about 80° Faht. A greater heat would evaporate the vinegar too fast.

“In about a fortnight the corrosion is finished, and the sheets of white lead are found near one fourth of an inch thick, and covered in some places with crystals of sugar of lead. As much as can be got off by a moderate degree of force is washed off. The washing is esteemed the most delicate part of the whole manufacture; during the progress of it, a white scum appears which is taken off, and a little pearlash being added, it is changed into white lead of a beautiful whiteness, and is sold for choice purposes, by the name of cream of lead.

“The remainder is mixed in different proportions, according to the market for which it is designed, with a pure sulphate of barytes, brought from the Tyrol. White lead manufactured by this process, with the exception of a shade or two of difference in its favor as to whiteness, is possessed of the same qualities, as that made in pots as previously described; but the process is much more expensive, and consequently it is not used to any great extent.

In the *Annales de Chimie*, vol. 79, 80, p. 326. Paris, it appears that M. M. Clement and Desormes, in Nov. 1811, communica-

ted to the editors of that work a process for manufacturing white lead proposed by Montgolfier. Thenard, in all the editions of his treatise on chemistry up to the 6th, (*see vol. 3d p. 158, Paris, 1834,*) also notices the same subject, and as his is more brief and equally explicit, we copy as follows, from him, viz :

“ Montgolfier has proposed a new method for making white lead, in which he uses this metal, vinegar, carbonic acid, and air. For this purpose he establishes, by means of a tube, a communication between a furnace of lighted charcoal, and the end of a cask containing a certain quantity of vinegar, and communicating also, by means of a tube from the opposite end of the cask, with a box filled with sheets of lead, cast and not rolled. The carbonic acid proceeding from the combustion of the coal, and mixed with nitrogen and oxygen that has escaped the action of the fire, enters the cask charged with the vapor of vinegar, and thence passes into the box containing the sheets of lead ; these are readily attacked, and there results, as in the Dutch process, a mixture of acetate and carbonate of lead, which they separate by washing.

From the fact that M. M. Clement and Desormes, having given publicity to this plan in 1811, and from its not having been since noticed even by Thenard, who resides in Paris, nor in any chemical or scientific work, as having been carried into successful operation, it is probable, that white lead cannot be made by Montgolfier's proposed plan, at least to any profitable extent. Indeed, Professor Steele states, that he had heard of it being done, or attempted, near Glasgow, but had also heard that it had there failed.

The objections to this plan are, first, the impossibility of obtaining a sufficient supply of oxygen through a furnace of burning charcoal ; and, second the procurement of a sufficient draft to, and diffusion of the corroding materials through, a case supplied with the sheets of lead, and otherwise arranged as M. M. Clement and Desormes have proposed.

Mr. A. I. Hamilton of the city of New-York, obtained letters patent from the United States, on the 8th November, 1813, for making that form of the carbonate of lead, called white lead.

For this purpose he sank cisterns of any convenient shape

and size, (less than three thousand gallons capacity) to the depth of ten feet, more or less, into the earth, in a molasses distillery, or any other convenient place. These cisterns were furnished with frame work and rods or laths within, for supporting sheets of lead, of any convenient size and thickness, and when so arranged, with the sheets of lead on the rods, vinegar was admitted to the depth of about nine inches on the floors of the cisterns. These cisterns were closed at their tops with strong tight covers, through which access was had by means of folding doors, which closed so tight as to prevent the escape of the vapors from within, "*and also to intercept the communication of atmospheric air*" and light with the cisterns and their contents. The natural heat of the earth was relied on to volatilize or evaporate the vinegar, and when this was insufficient, the deficiency was supplied by adding heat from a neighboring still, or by adding heated vinegar to that contained within the cisterns. The specification of Mr. Hamilton is long, and contains an account of many details, which from our present knowledge of the the manufacture of white lead, are of no consequence; sufficient has been stated to give the reader a knowledge of the leading features of his plan. An insuperable objection to its success is presented, in the exclusion of atmospheric air from the cisterns, which is a positive condition in it. Nor does it contain any provision for a supply of carbonic acid, without which, it is utterly impossible to make white lead. Nor will it be pretended, by the merest tyro in chemical knowledge, at this time, that white lead can be made without a free supply of those agents, viz: oxygen (contained in atmospheric air) and carbonic acid.

Mr. Edward Clark, then of Philadelphia, but now of this city, took letters patent on the 18th March, 1818, for manufacturing white lead. His process consists in triturating together a mixture of common salt, litharge, and water, in saturating quantities, until a chloride of lead be formed; water is then added in excess, the mass kept in motion, and carbonic acid gas passed into it by means of a suitable blowing apparatus, until the caustic soda, which had been set free by the union of the chloric acid of the salt with the protoxide of lead, becomes a carbonate;

when a reciprocal decomposition of the chloride of lead and carbonate of soda takes place, and there remained common salt in solution with water and white lead.

The liquor is next decanted for re-use; the white lead is washed till freed from the salt, dried, and is then ready for market.

The tubs used by Mr. Clark were about five feet in diameter, and two feet deep in the clear. Their bottoms were of marble, and they were lined with sheet lead. When flake litharge was used, the carbonate of lead with the chloride of soda was ground in a run of stones, and subsequently floated. The last operation is not necessary unless the peroxide of lead be present.

White lead made by this process was tried by several painters in the city of Philadelphia, and pronounced equal in quality to any other. An establishment was erected in that city to carry the manufacture of white lead on this plan into operation; but the person who was to furnish the requisite capital failed to do so, and it was applied to some other use.

The process above described is in conformity with strict chemical principles, and cannot fail in producing beneficial results, if applied to convert the litharge to white lead, which is formed by the process of separating silver from lead.

Mr. Jos. Richards took letters patent on 28th May, 1818, for making white lead. His process consisted in reducing small particles of lead, by attrition, one against the other and against the inner side of a leaden cylinder, which was supplied with water and carbonic acid gas, and by means of machinery made to undergo a continuous rotation. From this operation a fine white powder was procured, very much resembling carbonate or white lead, but which, on being mixed with oil, and used, assumed in a short time a yellowish or salmon colored tint, and left the inference that some other material than carbonic acid was present in combination with the metal.

A patent, dated 13th June, 1826, was granted to John Ham, of Bristol, England, for making white lead. See *vol. 6, p. 307, Repertory of Arts, London, 1827.*

Subsequently one or more patents have issued in this country and in England, securing to the inventors the right to manufacture

white lead by this process, or by a modification of it, in which carbonated alkalies and acids have been applied to correct the defect in color. The carbonates will not act upon the metal unless pioneered for by oxygen gas and a vegetable acid; and sulphuric acid which forms a white salt with the protoxide of lead, renders it insoluble in linseed oil, and disqualifies it for a pigment.

If the alkalies be used with the vegetable acid salts of lead, the product, it is believed, will be a bi-carbonate, deficient in body, and will prove a more expensive process of manufacture than that practised at Clichy.

(TO BE CONTINUED.)

[For the American Repertory]

MECHANICS' INSTITUTE.

CONVERSATIONAL MEETINGS.

SUBJECT, *Mortar.* It has been well ascertained that the mortar used by the ancients contained a much smaller quantity of lime than that now in use, but its admixture with the silex or sand is much more perfect or intimate. From the best accounts of their processes of making mortar, it appears that it was formed many months before being used, and placed in a pit dug in the ground, until wanted. After a few months it was taken up in a state nearly or quite untenacious, and beaten until it became perfectly soft or pliant, which, without the addition of water, will take place if sufficient labor be given in its manipulation. By this means every particle of silex or sand became coated evenly with the lime, and consequently it had a fair opportunity of bringing the particles within chemical distance of each other, which cannot be the case in the modern mode, of simply *hoeing* the mortar.

Bricks are usually covered with a slight coating of moulding sand, which is unattached; this should first be removed, or the mortar will attach itself to it, instead of the brick, and the want of this process will fully account for the *clean* condition of bricks when removed from walls built within the last fifty years. They should also be well washed and wetted before being used; by

this means the excess of lime is partially taken up by the water, and, on parting with the excess of water by evaporation, the lime forms a sort of dove-tail between the mortar and the capillary openings in the bricks. When we recollect the fact that seven hundred pounds of water are required to dissolve one pound of lime, it must be evident that the larger the quantity of water used, in the first instance, the more intimate must be the connection after its evaporation. When the bricks are dry, the mortar is robbed of its water, before its parts are sufficiently connected with each other.

It is a common fault to require the use of a larger quantity of lime than is necessary, and, as labor is more expensive than lime, the master mason is very willing to accede to such a request; as by a large addition of lime the mortar becomes for the moment so malleable or soft, that a workman can lay fifty per cent. more bricks in the same space of time. Such excess, for want of intimate admixture, soon changes to carbonate of lime, (isomeric with chalk) and being without a due proportion of silice, has no tenacity.

Sea sand should never be used; first, because it contains a quantity of chloride of sodium (common salt) upon the surface of the particles, which attracts moisture, and prevents its drying; and secondly, because from long attrition the particles become spherical, (round) and thereby have less tenacity than in any other form. In the choice of sand for making mortar that which contains much loam should be particularly avoided, its particles being too minute for adhesion. Broken marble is an excellent substitute for sand, the shape of its particles being extremely irregular, and its surfaces so fresh and clean as to offer no opposition to adhesion.

A member stated the fact that if six bricks were well cleansed of the moulding sand, and placed after being wetted, with *well worked* mortar between them, a weight of 80 pounds could be raised attached to the lowest brick, by lifting the uppermost one, in six hours after their arrangement. Whereas two bricks placed together, with ordinary mortar between, without being cleansed or wetted, could not be raised in the same manner without separating.

STEAM FIRE ENGINE.

In these evil days, when that destructive agent, Fire, is continually spreading its devastation around, demolishing the fair fruits of anxious labor, and withdrawing for ever from the community in general, millions of capital, which, being preserved and circulated would probably have gone far to prevent the commercial embarrassments that are every where felt; it becomes the ardent wish of all well disposed persons to devise or to witness the operation of an instrument calculated to mitigate, even if it cannot prevent, calamities such as of late have become so awfully frequent, both in city and in village, in crowded towns and in isolated dwellings.

It is not our province here, to enter into the consideration of the causes, nor to suggest means of prevention, so far as the conduct of mankind for vigilance and rectitude are concerned; but taking the mere fact, that fires are awfully numerous and destructive, and that every day witnesses the diminution of private property as well as the abstraction of public wealth, through these dreadful conflagrations, we anxiously turn to inquire what steps can be taken in the mechanical and scientific world, to assist the sufferer, by arresting the progress of the evil.

In this view of the matter we are pleased to see that the *Mechanics' Institute of New-York*, is among the earliest in promoting so beneficial a purpose; for we find that a resolution of the *Institute* was carried unanimously, on the 7th January last, to the following effect:

“*Resolved*, that the gold medal of the Institute will be awarded for the best plan of a *Steam Fire Engine*; the plan to be illustrated by proper drawings, or by a model. Such plans only, with their illustrations, will be admitted for competition, as shall be considered useful. The plans, &c. to be submitted to the “Committee of the Institute, on Arts and Sciences,” before the 4th day of July, 1840, and not to be opened by the committee before that day, unless by the consent of the proposer.”

Now, this is a noble and liberal offer, and quite to the extent to which an institution of this nature can proceed. It will form a proud distinction to every lover and follower of the mechanic

arts, and every cultivator of science on account of its beneficial effects to mankind ; it will doubtless be a sufficient stimulus also to many who aspire to transcend in skill, and utility, the mass of their fellow citizens ; but how much further will their zeal be carried out, when they reflect that, haply, their invention may be the instrument to save numerous lives and immense property ; that they may be becoming the benefactors of the human race ; and, even that their ingenuity, although a happy specimen and replete with good, may be but an important stepping stone to more grand inventions, of which they may be considered the founders !

We feel assured that this call on mechanical genius will meet a warm response, and that the energies of many an ingenious artizan will be called into action for so patriotic an act ; and we look with confidence to numerous bright and useful specimens of art, calculated for the very important purpose to which we have here called attention.

PETRIFICATION.

It was stated by a member at a late conversational meeting of the Mechanics' Institute that he had seen a tree, in Onondaga county, in this state, part of which was in the water and turned to stone, or petrified, and the remaining part unchanged.

It is usually supposed that petrified wood (so called) is a pseudo-morphous formation ; in other words, that the capillary tubes of the wood are first filled with the mineral in solution, which is gradually precipitated from the water ; the woody fibres between are next decomposed and pass away, leaving a new set of tubes, which in their turn fill with the mineral, and thus we have a *cast* of the wood, without one particle of the original remaining ; although it resembles it so closely in appearance as to be sometimes mistaken for it.

☞ We omitted in our last number to give credit to Mr. John McNaught as inventor of the improved Steam Indicator used on board the British Queen. We were misinformed on the subject, and therefore take pleasure in correcting it. ED.

AGRICULTURAL GEOLOGY.

Third Annual Report on the Geology of the State of Maine. By CHARLES T. JACKSON, M. D. &c. 1839, pp. 276, with a catalogue of specimens collected by him during the previous three years.

We have long been impressed with the importance of so arranging geological reports as to make them available for the use of the agriculturist.

Nothing is more common than to hear farmers dispute as to the kind of manure best suited for particular districts, without the aid of chemistry being called in to decide the question.

We have analyses of soils of almost every ten miles square in England, and well know what crops are most thriving in each district; how easily, then, can an analysis be obtained of a soil in which the farmer intends sowing wheat; and by comparing such analysis with that of the best English wheat soil, ascertain in what particular component it is wanting. As an example in point, Duchess county, in this state, for many years was comparatively without value, until by accident it was discovered that sulphate of lime (Plaster of Paris) produced immense crops; the consequence has been sudden wealth to the land holders.

Had any proprietor compared his soil analytically with the best soils of England, for similar crops, he would have found it deficient in this article, and consequently would have availed himself of the fact, without waiting for accidental development.

Charles T. Jackson, M. D. geologist to the State of Maine, has lately published his report, and through the kindness of a friend we have it upon our table.

Under the head of Agricultural Geology, we find the following:

Of all the arts, I know of none more likely to be improved by geological examinations, than that of Agriculture; since the composition of soils indicates their fertility, or capabilities of improvement, and the causes of barrenness. The science of geology demonstrates the origin and distribution of the mineral matters, constituting the basis of all soils, to which they chiefly owe their peculiarities. I know that it is a favorite opinion with many agriculturists that the mineral constituents of a soil have but little, if any influence on their fertility; and that they suppose the whole secret resides in the presence of certain vege-

table or animal matters; but such a theory is at once exploded by an attentive examination of the natural soils, with their peculiar vegetation; for it will be seen that there are regular zones of vegetation, peculiar to each geological district, in which the same vegetable or animal matters are present, but which differ essentially in their mineral constitution. Thus how different is the soil derived from granitic rocks, from that which is formed by the disintegration and decomposition of limestones and slates. How peculiar is the vegetation which follows the great bands of trap rocks, and how remarkable is the growth on the ancient clay loams of tertiary deposition. Whoever considers the attempts made to raise wheat upon soil totally destitute of lime, will at once appreciate the value of that mineral substance, and its importance in the production of grain. An imperfect or blighted product is sure to follow the planting of this grain upon soils destitute of lime, while it is well known that certain districts, where the soil contains this mineral, are always favored with luxuriant and heavy crops. This is one of the settled points in agriculture, and one which every farmer should duly appreciate, if he wishes to prosper in his art. Indian corn requires but little, if any, lime, and hence we see excellent crops of that grain raised upon sandy plains, unsuited to wheat. Rye, likewise, will do pretty well without it, but it is always more full and heavy where it exists in the soil; and by attending to this circumstance, the value of the crop may be greatly improved.

We regret that our space will not admit of further quotations from this most valuable document; but suffice it at present to say, that Dr. Jackson has given tables of soils in Maine, with the successive crops from each. By these tables the farmer can readily ascertain what crops can be raised without manure, and what manure is necessary for raising particular crops; we consider the Doctor entitled to the warmest thanks of Agriculturists.

The other parts of the report are distinguished by equal ability, and numerous practical uses are suggested for the different minerals described

ED.

For the American Repertory

APPRENTICES' LIBRARY

Of the General Society of Mechanics and Tradesmen.

MR. EDITOR :

You, in common with all enlightened, benevolent, and liberal men, cannot but derive pleasure from the knowledge, . . . that numerous plans are in operation, both at home and abroad,

for the promotion of intellectual and moral improvement, and consequently of the harmony and order of society, and the happiness of its members. When you are informed of any new effort for the attainment of an object so greatly to be desired, you will doubtless be ready to hail it, with cheerful and hearty wishes for its success. You will not therefore refuse a place in your useful pages, to the following paper, which, with several others, owes its origin to an undertaking of the kind alluded to. It was written by an apprentice, who is learning the trade of a blacksmith; and it was read by the writer, on the 30th of January last, before a number of young men, mostly apprentices like himself, assembled in the lecture room connected with the Apprentices' Library, in Crosby Street, in the Institution of the "General Society of the Mechanics and Tradesmen" of this city.

My object in desiring its publication is, to direct the attention of apprentices and others, to the library and the lectures established for their benefit; also to encourage those who already avail themselves of the institution, in the exercise of writing on any subject with which they may think themselves sufficiently acquainted, and reading their productions; or, if they prefer it, allowing them to be read by others, before their companions. This exercise, it is believed, will greatly tend to draw out their faculties, improve and strengthen their minds, give them confidence in themselves, and facility in using the knowledge they may have acquired.

It will hardly be disputed, that in these days of steam printing, sufficient time is not always allowed for the mind even to comprehend, what is read, much less to arrange and digest it, before some other subject is brought forward; so that a great many books may be read, yet, but little knowledge attained. Its surface, perhaps, is extensively but superficially skimmed over, while its depths are seldom explored, or its treasures brought to the light. The exercise of committing to paper the import of what we read, together with our own thoughts on it, will help to correct this habit of superficial reading, as well as greatly assist in giving distinctness and vividness to our impressions

and fixing them in the memory, and will thus render them useful for the purposes of life.

As to the merits of the paper itself, profound scholarship, original views, or thoroughly wrought argument, was not to be expected ; yet, assuredly it is highly creditable to the writer, and shows that *his* reading has been accompanied by both reflection and observation. In its tone and spirit it appears to be intended not to detract from a just degree of respect and consideration for others, but to call the attention of young mechanics to their actual position in society ; and, by presenting them with elevated views of the usefulness of their several occupations, to ennoble their aim and their ambition, and to impress upon them the important truth, that only by the improvement of the mind can they hope to attain their true position, in the estimation of their fellow citizens, and to fill their places in society with usefulness to others, and credit to themselves.

Not doubting, Mr. Editor, your willingness to lend your aid to promote this design, it is hoped that the insertion of the paper will not be found incompatible either with your views or arrangements.

S.

ON THE POSITION OF MECHANICS IN SOCIETY.

Gentlemen of the Committee,

I cannot offer this communication without expressing my heartfelt thanks to you for the interest you take in the instruction of apprentices ; and permit me to say, that I think we shall reap great advantages from the plan of allowing us to express our views on any subject we think proper. I have little hope that you will approve of either the subject I have chosen, or of the manner in which I offer my thoughts on it ; I know, however, you will make every allowance for the first attempt of an apprentice ; but whether you consider the following remarks appropriate or not, one feeling shall be always uppermost in my heart, a feeling of gratitude for the exertions you are making towards the enlightenment of our minds.

E. C.

FELLOW APPRENTICES :

In consequence of the proposition made to us by the committee of the society, attached to the institution, I appear before you for the purpose of offering my views on a subject of my own choosing. The subject I have chosen, is the utility of Mechanics to Society, and the station which they hold in it. I must say that I entertain very little hope of being able to give much satisfaction. I know, however, that you do not expect to hear anything learned from an apprentice, and, that whatever errors I make, in this short attempt to express my thoughts, will be forgiven and looked over. I have sometimes reflected on mechanics and tradesmen as a separate body, and it has occurred to me, that they do not hold a very elevated rank in society. This will appear to us more surprising, when we consider that the world is chiefly indebted to them for the greater part of its necessities and comforts. If then mankind are indebted to them for the greater part of their necessities and comforts, it follows, that they must be the most useful members of society ; to satisfy ourselves on this point, we need only cast a glance at what is passing around us ;

almost every thing that offers itself to our view, affords a proof of the benefit arising from the labors of the tradesman and the mechanic. What a fund of delight, what a field of instruction, does it not present to our minds, to mark the progress of manufactures from their first simple origin to their most perfect state! How pleasing it is to look on the exertions of any one class, from the making of a small boat, which may serve perhaps for the accommodation of a pleasure party, to the building of a large ship, which assists every branch of trade, and commerce, which is one of the chief means of the defence of nations, and which serves to carry the lovers of knowledge and science in search of new wonders, and in the exploring of unknown regions. Let us turn our eyes from this; let us take a look at ourselves and we shall find that the clothes which we use as a covering for our bodies, which serve to protect us from the inclemency of the weather, and which are indispensable to our comfort, are supplied to us, by the labor of the wool gatherer, the spinner, the weaver, the dyer, the carpenter, and the machinist; but perhaps I cannot better illustrate this subject, than by pointing out the advantages derived from the trade, to which I am an apprentice; I mean that of a blacksmith. Taken in its different branches, nothing can afford a more convincing proof of the ingenuity and skill of the mechanic, than the working of iron, in various ways. What reflections does it not cause to arise in our minds, when we look at the simple ore contained in the earth, manufactured into so many things, of so much benefit to man! We see all our domestic utensils made by one branch, a great many of the tools of the carpenter, and of almost every other mechanic supplied by another; the vaults of banks, the railings, and balconies, which are so much of an ornament and advantage to our houses, and a great many of the utensils of the farmer are likewise the work of their hands; but, that wherein their great skill is displayed, and where this labor is most beneficial, is in the manufacture of that greatest and most beautiful of inventions, the steam engine. Here we behold a mass of the most complicated machinery, with the greatest regularity, and serving for the most useful purposes; made to assist in almost every branch of trade, and conducting produce on our rivers and railroads, with the greatest rapidity. I need not, however, go on to point out its advantages; neither need I bring forward more proofs of the utility of the mechanic; these things are apparent to every one who takes time for a little reflection. I must say, however, that many of the wonders and beauties of natural philosophy would be unknown to us, were it not for the assistance rendered by mechanical arts. It is true that the philosopher can go a great length unaided, but many things, of which we are now certain, would rest, perhaps, on conjecture, had it not been for the telescope and other instruments for the promotion of science. But, although every thing we see passing around us convinces us of the utility of the mechanic; every thing, from a small boat, to the building of a ship; from the manufacture of a pin, to the production of a steam engine; although the labors and researches of the philosopher are aided by them, yet, in my opinion, they hold only a secondary rank in society. It will not, I presume, be disputed, that people generally look upon those who are surrounded with wealth, with more respect than they do on the working man; those persons in their turn who roll in every luxury that riches can procure; those persons who occupy the higher ranks, and follow what are styled the learned professions, look upon the man who earns his bread by the sweat of his brow, with feelings of indifference, if not of secret contempt; they seem to pride themselves on the possession of things which, perhaps, they had no hand in acquiring, and which were probably bestowed on them by birth or the blindness of fortune. It is a cheering reflection that talent or genius is not confined to these people. Wealth may procure luxuries, it cannot, however, add one iota to the formation of the mind. The greatest men that the world has ever produced, have come from the poorer class of people. Look back to the time of the revolution, to the times that tried men's souls, and we shall find that many were tradesmen and mechanics, who contributed to establish the independence of this country, and around whose name a halo of glory now rests, brighter and more lasting than could be procured by the wealth of all the nations of the earth. But there are proofs which we can behold every day, which afford strong arguments that many mechanics must possess superior minds. Look on this city; look on some of its beautiful architecture; look on many of its noble edifices, and tell me if it does not require a man of superior mind to lay the plan of one of these! Yes, the man who draws the plan of one of these edifices, must possess genius and talents; and, perhaps when some of these lords, who would think the touch of a mechanic contagious, were plundering the ancient temples of Greece, for the purpose of adorning their private cabinets, it never occurred to them, that the men who constructed those noble specimens of architecture, must have possessed minds far superior to themselves. There are many persons in possession of great wealth; some have procured

it by their industry, and on some it has been bestowed by their birth, many of them I know, possess the most noble minds and the brightest genius, I do not mean to say they are all in possession of such narrow sentiments as to despise the working class, but I think I can boldly assert from my own observations, and from what I see passing around me, that mechanics are considered as holding only a secondary rank in society; and why fellow apprentices is it considered so? Chiefly, in my opinion, because they have not been careful enough to increase their knowledge by study. The majority of mechanics have remained satisfied with being good workmen; but they ought to reflect that unless a man possesses more knowledge than what he derives from his trade he will never be qualified to hold any important station, nor will he ever be much respected. It is true that many of our class have attained to the highest distinction, and they afford a striking proof of what others might attain if they would only follow good example. It may be said that we require some amusement after the fatigues of the day; but the most pleasing and rational amusement is to increase our stock of knowledge. What a source of delight it would be to us if we knew the properties of the materials we use in our different trades, and of what they are composed! But it may be also said, that a person who is learning a trade cannot afford much time towards the improvement of his mind. I cannot better refute that idea than by mentioning the name of *Benjamin Franklin*. Is there any apprentice, is there any tradesman, is there any mechanic, whose heart does not beat with joy, when he can point to that eminent individual as one of his own class? How did he become so distinguished? It was by devoting his leisure hours to useful and profitable study! Would it have entered into the imagination of any of those persons who may have looked on Franklin, when he first walked along the streets of Philadelphia, with his bundle in one hand and a roll of bread in the other, that he was yet to become the greatest philosopher of the age; that he was yet to divest the lightning of its terrors, and teach mankind how to guard against its effects? We know this has been the case, and although it would be difficult for any of us to think of attaining his eminence, yet we ought to look on him, as an example of what may be gained by exertion. And here let me say, that he had not so many opportunities to improve himself, as we have; ought we not, therefore, to feel thankful to the society of mechanics and tradesmen for the exertions they are making in our behalf? Look at the advantages we possess; we have a library, where we can procure the works of the choicest authors; we have lectures delivered to us by eminent and learned individuals; and we are allowed to express our thoughts on any subject. Let us, fellow apprentices, evince our gratitude for these things, by our exertions to improve our minds; let us give up vain and frivolous amusements, and devote our leisure hours to increasing our stock of knowledge. Let us do this, and we shall have the gratification of knowing that we contribute something towards raising mechanics to where they ought to be, amongst the first, the most learned, as well as the most useful members of society.

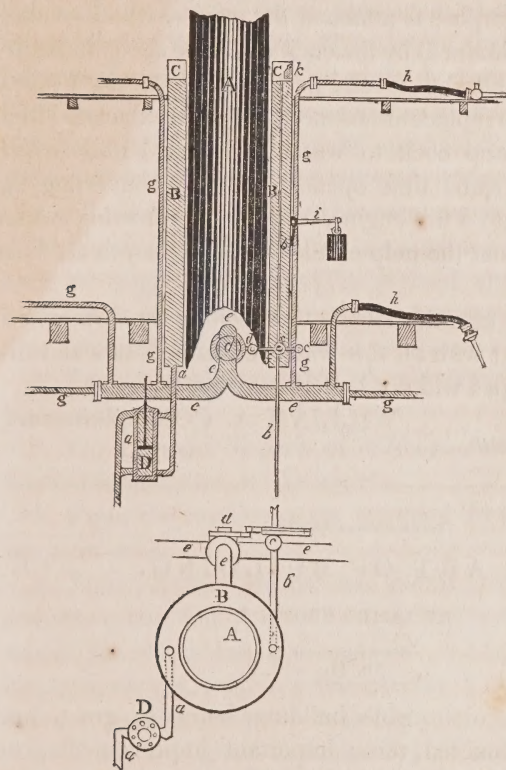
We have not presumed to tamper with the style of this interesting essay. As it stands it affords striking proof of the eminent advantage arising from the liberal provision made by the Mechanics and Tradesmen's Society for the cultivation of the mind among apprentices and youth generally. We trust and believe it will stimulate many a one to self-examination, and urge them both to increase of knowledge and to the delicate art of expressing clearly what they may understand truly. ED.

Report of the Committee on Arts and Sciences of the Mechanics' Institute, on H. R. & J. E. SERRELL'S means of preventing and extinguishing fires in steam vessels.

The recent calamity of the burning of the Lexington has roused the public mind on this subject, to so great an extent that

numerous plans have already been proposed for the prevention of such occurrences in future. Not one of these, thus far presented to the committee, appears so perfect in all its parts as that of the Messrs. Serrell.

The engraving represents a cut section and plan.



A, smoke pipe of the engine. B, cylinder, concentric with smoke pipe, leaving an annular space between, of from six to ten inches.

b, waste pipe, reaching to within 12 inches of top of cylinder; its lower end passing through cylinder to lead off the surplus water. The cylinder B extends from top of boiler through the main and promenade decks.—

The upper part

of cylinder B (marked C) becomes an air vessel, being above the mouth of waste pipe b. The forcing pump D, used to supply cylinder B, and receiving its supply from the river or condensed water, through the pipe a, may be worked either by the engine or by hand, as most desirable. Thus it will be perceived that, as the cylinder B is always full of water, no fire can be communicated to the vessel from the smoke pipe, and the annular space between smoke pipe and cylinder B is sufficient to prevent the cold water from injuring the draught of the fire. Part of the heat given off by the smoke pipe can be made

available, by feeding the boiler from the waste pipe *b*, which would give a supply of warm water.

In addition to the above enumerated advantages, the inventors purpose to convert their apparatus into a fire engine, to extinguish the fires which may occur in other parts of the vessel. For this purpose is attached the main *e*, which is connected with the cylinder B by the cock and tube *d*. *g* and *h* are hose pipes to be carried to any part of the vessel; *i* safety valve; *k* air valve, to replace atmospheric air when exhausted from air chamber C; *r* stop cock to waste pipe *b*; *c* handle which shuts *r*, and at the same time opens *d*, thereby converting the whole apparatus into a fire engine, capable of throwing water either with or without the help of the steam engine, to all parts of the boat.

When not in use as a fire engine, by opening the lower hose pipe *g*, so as to part with all the water contained in *e* and its connections, the pipes will not be liable to freeze.

WILLIAM A. COX, *Chairman*.

New-York, February, 1840.

[For the American Repertory.]

THE ART OF BUILDING.

BY JAMES FROST.

No. II.

The value of incombustible buildings being so great, and their utility so undoubted, these important improvements, can only have been neglected in this rapidly improving age, from dread of great expense, and apprehension of great difficulty in the execution.

Now, as the only really difficult parts of such buildings are the roofs and floors, we shall first enquire how these portions of incombustible buildings have been hitherto formed, in order to ascertain what difficulty really exists; what remedies have been applied, and what success has been obtained.

In ancient structures very massive arches of great comparative height, were employed; in modern, lighter or lower and

flatter arches have been used; although in all periods, arches of many varieties of curvature have been adopted, viz: semi-circular, semi-elliptic, segments of either, double segments, or pointed gothic, parabolic equilibrated, &c. groined or intersected arches of every variety of curvature before enumerated; yet, various as these forms may seem, they are all reducible to one distinct kind, being all arches of single curvature only, or what workmen term circular work, as distinguished technically from circular circular work, as arches of double curvature, spherical segments, or similar double curves; the peculiar useful properties of which have been strangely overlooked and neglected, and will therefore require to be hereafter fully dwelt on.

At present we shall confine our attention to only one kind of arch of single curvature, the groined arch; because it has been much more extensively used than any other, and has been thus preferred for the following good and efficient reasons:

1. For the smaller quantity of materials than is required for plain arches.

2. For a greater degree of stiffness, caused by the angular bonded intersection of the arches.

3. From the smaller space occupied by groined arches than by plain ones.

4. From all their vertical and lateral pressures being condensed into a few points, as to the four angles of a single room only, where the walls are not required of any particular general strength, except only in a few places; a circumstance of great value in peculiar forms of building.

5. From their great susceptibility of ornament, beauty, and grandeur; which latter qualities, many ancient groined arches exhibit in an admirable degree.

These fascinating appearances were on many occasions obtained in most elaborate masonry at great cost; yet in other instances the same were gained with great economy and effect, as I witnessed in the conversion of some ancient monastic buildings to modern purposes. These buildings, each about two hundred feet in length, and thirty-five feet in clear in width between the walls, contained in the centre of each, a row of ten fasciculated columns, from whence, and from corresponding op-

posite semi-columns placed against the walls, spring pointed gothic arches, with angular moulded ribs, and a proportion of smaller arches interlaced in intricate tracery of very pleasing forms.

These arches presenting externally the appearance of solid stone, although then of the age of six centuries, seemed made to endure for ages ; yet on removal were found unattached to the walls of the buildings, and composed of plastered surfaces. The angular and other ribs of brick, originally moulded to the required forms, and the large plain or main surfaces of the arches were formed of common bricks, four inches in thickness only ; while the spandrills, or large space above, forming the body of the arch, were filled in with mould, which supported the stone floor above as firm as a rock.

As these ancient and beautiful arches and floors, though so strong and durable, contained only one fourth the valuable materials employed for the same purpose in modern structures, (the mould being valueless) they exhibit a desirable combination of great ingenuity with economy ; and, being the production of what is now termed a dark age, may teach us not to be too proud of our present all-sufficiency.

But these ancient arches and floors were very ponderous and massive. Their least average thickness of mould and masonry being four feet, their weight exceeded four hundred pounds per superficial foot of floor, while the greatest load calculated for as many persons as could congregate thereon, being about one cwt. per suppl. foot, and the arches and floors were four times as heavy as their load : their whole weight loaded would amount to twenty five tons per square. The floors, occupying each four feet perpendicular height in the building, consumed a large space thereof, and the great weight of these arches pressing on a few points only, vertically and laterally, with corresponding force, demanded a large mass of masonry in walls and buttresses to support and to resist this enormous lateral pressure, four fifths of which we have seen were expended to support one fifth its greatest incumbent load, besides rendering a very considerable portion of the building useless.

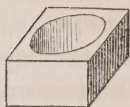
These united considerations, have led to considerable im-

provements, specimens of which may be seen in those splendid works, the new Exchange and the new Custom House, in the city of New-York. In these magnificent works numerous floors are constructed on groined segment arches, about the average thickness of two feet, their height and weight consequently only one half that of the ancient arches previously described, and thus occupying only one half the perpendicular space in a building, are greatly preferable. But these modern arches, spandrills, and floors, being formed of a solid mass of cemented brick work, require nearly four times the quantity of valuable material for an equal superficies of the ancient floors. From the less weight of these improved arches, only one half the vertical pressure is borne by the walls; yet from their lower altitude they exert as great horizontal thrust, and still require as great a sacrifice of space and masonry to support the continued lateral pressure; and their gross weight is still double the weight of the greatest load they are constructed to bear.

In these two works, the production of different artists, may be seen a singular difference in the result of the employment of the same means to accomplish the same ends, each artist using thick walls and buttresses to resist the lateral pressure of groined arches; yet the employment in one building of interior, and in the other of exterior, buttresses, secures much more internal and useful space in the former, and with a far better appearance externally than in the latter—a valuable instance of great effect obtained without cost.

Attempts were made many years ago, both in London and in Paris, to reduce the weight of arches, by substituting hollow pots, [coombs] for the solid bricks commonly used.

These hollow pots, externally of a square form, internally circular, with one solid end, like common garden pots, were but of little more than half the weight of brick; yet but seldom used, because they were a very expensive substitute, always limited in use to plain arches, their shape rendering them inadmissable in groins, a form generally preferred. Similar pots, though of an inferior form, are found in ancient arches.



Having thus obtained a concise and popular view of favorable and improved specimens of ancient and modern incombustible floors, as supported by arches, for the sake of comparison with the improvements I have to introduce, I shall now proceed to detail the result of numerous experiments, occupying a long period, conducted at considerable cost, and terminating full of promise of extensive improvements resulting therefrom.

My first attempt succeeded in procuring a very cheap and very preferable substitute for bricks (which being formed of sandy loam are weak and heavy) by manufacturing from strong tenacious clay, by machinery, hollow earthen ware tubes,



square in the section, the apertures thereof being two thirds as large as the area of the tubes; and thus from the great strength and natural levity of the material, and from the large proportional aperture, these tubes were of much less than one third the absolute weight of a corresponding quantity of brick; yet an all sufficient substitute therefor in arches, as numerous trials have fully and satisfactorily established.

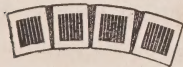
Although these tubes may, at first sight, appear inadmissible for the construction of groined arches, as they neither admit of cutting at, nor possess sufficient strength to form the angles of groins, yet they may be easily and efficiently adapted thereto by the introduction of a small rib of cast iron, at each angle of the room, each rib being furnished with a double projecting and moulded edge, as here represented; these angular ribs, receiving the whole weight of the groined arch, transmit all the weight and all the lateral pressure thereof to four small iron bearing-plates, each one situate on the walls in the corner of the room; and these plates being easily and effectually connected by flat iron bars, (or iron bond) the lateral thrust of the arches will thus be effectually resisted, and the walls perfectly relieved from any lateral thrust whatever, in any and every part, a property derived from the peculiar form of arch under consideration.



Now, upon these tubular arches, tubular ribs may be placed, twelve inches asunder, to support a tubular counterfloor, to

receive a coat of cement; we shall then obtain a substantial and incombustible arch and floor, little if at all exceeding forty pounds in weight of each suppl. foot of floor over rooms of moderate dimensions, and possessing many other peculiar advantages, to be hereafter detailed. It is almost superfluous to add, that plain arches of a moderate span may be constructed equally light, upon the same principles.

My next attempt consisted in the employment of arches of double curvature, or spherical segments, which will in many cases be found greatly to surpass all others in stability, solidity, and economy. This form, possessing immense strength, admits, also, unrivalled lightness, having the peculiar property of being strong in itself. While all arches of single curvature require great loading to enable them to sustain any weight whatever, and most of them being unable to sustain even their own weight without a considerable load thereon, these spherical arches are free from this great defect, and may be even left open at the crown, should light, or any other desirable object, be thereby attainable, without the least diminution of their strength. Common sized floors have proved abundantly strong, supported by arches formed of one course only of hollow tubes, three inches to four inches square in the section, or on an arch three to four inches thick, and consequently not of greater weight than one inch of common brick arch.



On these tubular arches, tubular ribs were placed a foot asunder, to support a cemented tubular counterfloor, or a stone or other floor.

The whole space occupied by arch, spandril, and floor will be less than one third, and the absolute space and weight less than one fourth, of the best floors, and the very latest production of two of the most talented artists.

As these floors, arches, and ceilings will not weigh forty pounds per suppl. foot, they will not require thicker walls than the common combustible ceilings and floors; for, wooden floors weighing less than 30 lbs. per. foot suppl., are supported by only two walls out of the four; while these arches, resting alike on all four walls, consequently press less upon each wall when loaded, than floors of timber, and which will be found also, on comparison, to

occupy a greater average absolute space than these substantial and enduring substitutes, because they occupy so very little space at the crown.

But we have seen groined arches are of great weight, resting upon four small feet only, where a corresponding great lateral pressure being exerted, to resist which it has hitherto been deemed essential to employ a great quantity of materials, in the form of thick walls, buttresses, or of both. The great expense of this, onerous and forbidding as it is, forms but a minor part of the evil in valuable situations, because an enormous quantity of space is sacrificed for this purpose only. For when to the space lost vertically is added that lost horizontally, one third of the useful available room in a building is commonly destroyed ; so that by the employment of an improved mode, not only a vast expense of time, labor, and money may be saved, but half as much more available room be obtained on the same surface, and two lots thus appropriated, afford as much as three vaulted in the usual mode.

These desirable results are secured by balancing the lateral pressure of one part of the arch against its opposite portion, instead of the present mode of balancing the lateral pressure of an arch against the pressure of enormous walls and buttresses ; and these advantages can be secured by employing arches of less than one fourth the usual weight, with bearings equally diffused over an extensive surface, being nowhere intense or great, can be readily and cheaply resisted, by connecting the bearing walls with diagonal or parallel ties, or both. These ties, being concealed within the hollow spandrills, between the incombustible floors and arches, in this peculiarly secure situation timber ties may be safely employed in ordinary buildings, by those desiring to save the additional expense of metal, and as wood can now be preserved at little cost for an indefinite period, durable and inexpensive ties are thus attainable.

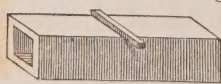
In valuable buildings, metal ties will be so securely protected in these air-tight and temperate situations, as to remain uninjured to remote ages, and as bars requiring little labor for conversion serve for these purposes, the expense of metal will not be found objectionable.

But these enduring floors possess several other important advantages, from their peculiar formation. It is well understood, that a stratum of confined air is an almost perfect nonconductor of heat, cold, or sound. Now, as each of these tubular arches, spandrils, and floors, contains a stratum of air, the combined action of three strata must render them perfectly impervious to heat, cold, or sound, and their firm construction and sound cemented surfaces will as effectually obstruct the passage of any offensive odor or noisome or pestilential exhalation. These floors, then, are in every one of these important respects immeasurably superior to the common combustibles.

The materials for these floors being as inexhaustible as cheap, and easy of conversion, the expense thereof being principally for labor, the expenditure therefor will remain at home, and the timber hitherto employed, of the most valuable kinds, will remain an important article of export, advancing the immediate resources of the country, as well as its permanent prosperity, by the exchange of perishing combustible wood for enduring and incombustible buildings.

As such great strength has been herein attributed to arches of double curvature, an experiment may be easily made as satisfactorily exhibiting their superior strength, compared with common arches of single curvature only.

Take two pieces of similar tin plate, bend one piece into any single curved arch, and apply such a weight on the apex thereof as will cripple the arch. Then having formed the other tin plate into a spherical segment, it will support uninjured a great weight, perhaps, scores of times the weight which crippled the first, and this superior power is evidently derived from the form alone. And to show the strength of the hollow tubes, take one, only three inches square externally, and two and a half inches square internally; its sides being only one fourth inch thick; its length being twelve inches; now embedding it



horizontally, thus, on a portion of cement at each end, and bedding a small piece of iron across the middle of upper side, apply weights gradually increasing till the tube is broken.

A good tube of this size will support full eleven hundred

weight, and from this and other experiments may be deduced the fact. The material possesses both a tensile and a resistile force, each exceeding a ton upon the sections of a superficial inch, being fully equal to half the similar powers of good fir timber.

Here, then, for the present, we must postpone the subject of improved arches, to proceed with the construction of incombustible floors and roofs, without arches; but we are not to assume the consideration of the useful properties of arches as terminated, but, on the contrary, as a future subject of intense interest.

(TO BE CONTINUED.)

NOTICES OF FINE ARTS.

ENGRAVED PORTRAIT OF GENERAL HARRISON. *Published in Philadelphia.*

We have just seen this very beautiful mezzotint, executed by J. R. Sartain, from a picture by J. R. Lambdin, painted in 1836. As a likeness it is unquestionably good, and as a production of art is decidedly one of Mr. Lambdin's best efforts. The engraving is in the highest style of excellence, and very creditable to our sister city.

An amateur of this city has lately received, from London, a picture by Sir David Wilkie, which, we understand, he generously permits to be examined by the lovers of the art. We cannot doubt that such a gem will prove highly instructive.

The work is, in every degree, worthy of the very high reputation of the artist. The subject is exquisitely conceived, beautifully composed, and in that peculiar excellence of the present English school, *light and shadow*, is surpassingly beautiful. The general impression, however, among our artists, seems to be that it is less finished in the detail than Sir David's earlier works. The amount paid for this picture we understand to have been \$2,000.

We were much pleased, a few days since, with a group of portraits, miniature size, painted by our esteemed friend Mr. T. S. Cummings.

It is composed of three figures, two of which are engaged playing chess, and the third watching the progress of the game. Nothing is more difficult than the management of drapery and other accessory parts of a picture on ivory, and yet all these are so composed as to combine the force of oil painting with the beauty and delicacy of miniature. We have long been an admirer of this beautiful art, and perpetrated some specimens of our folly; but in viewing the work of Mr. Cummings, we freely confess that our own insignificance becomes more apparent than meets the approbation of our self-esteem.

This gentleman may, unquestionably, be said to occupy the first place in his department of art. His style is quiet, just, and unobtrusive; he represents nature as she is, and not as the crazed imagination of a poetical enthusiast would depict her.

Unfortunately for the painter in small, his works do not occupy sufficient space to catch the eye of the sapient critic, and but few, therefore, have ever received the reward of praise due to their merits; but when it is recollected that they are required to represent nature in a reduced size, with at least as great accuracy as the oil painter, and this too, with the most fragile materials, it cannot be doubted that they are entitled to, and should receive, at least an equal rank with those engaged in any other department of art.

W. PAGE, A., is again destined to surprise his friends. We had the gratification, a few days since, to view a composition, intended for the next exhibition of the National Academy of Design, consisting of a group of three figures, namely, of a soldier, his wife and child. The father is blowing a whistle behind the child, who, surprised at the sound, looks up at the mother to ascertain from whence it emanates. The pleasure of both parents is happily depicted, and the surprise of the child does great credit to the imagination of the artist.

The daring arrangement of color, and the complete mastery of the consequent difficulties dependent upon toning a picture to so high a scale, would do credit to Gainsborough. We pronounce it, without the fear of contradiction, a chef d'œuvre of art.

THE DAGUERRETYPE.

We give below a description of this most interesting discovery, and take great pleasure in stating that several gentlemen of this city, among whom, we may name Dr. Chilton, President Morse, and Professor Draper, have fully succeeded in procuring fine specimens of photogenic drawing, by means of this instrument.

Translated from the original paper of L. J. M. Daguerre, (the inventor,) by J. S. MEMES, L L. D.

Practical Description of the Daguerreotype. Material to be employed in the photogenic process. Five steps of the process explained. Polishing the white coating with Iodine. The Camera. Mercurial process. Fixing the impression, with descriptions of the Apparatus.

THE designs are executed upon thin plates of silver, plated on copper. Although the copper serves principally to support the silver foil, the combination of the two metals tends to the perfection of the effect. The silver must be the purest that can be procured. As to the copper, its thickness ought to be sufficient to maintain the perfect smoothness and flatness of the plate, so that the images may not be distorted by the warping of the tablet; but unnecessary thickness beyond this is to be avoided on account of the weight. The thickness of the two metals united, ought not to exceed that of a stout card.

The process is divided into five operations :

1. The first consists in polishing and cleaning the plate, in order to prepare it for receiving the sensitive coating, upon which the light traces the design.

2. The second is to apply this coating.

3. The third is the placing the prepared plate properly in the camera obscura to the action of light, for the purpose of receiving the image of nature.

4. The fourth brings out this image, which at first is not visible on the plate being withdrawn from the camera obscura.

5. The fifth and last operation has for its object to remove the sensitive coating on which the design is first impressed, because this coating would continue to be affected by the rays of light, a property which would necessarily and quickly destroy the picture.

FIRST OPERATION.

Preparing the Plate.

The requisites for this operation are of :

A small phial containing olive oil.

Some very finely carded cotton.

A small quantity of very fine pumice powder, ground with the utmost care, tied up in a bag of muslin, sufficiently thin to allow the powder to pass through when the bag is shaken.

A phial of nitric acid, diluted with water in the proportion of one pint of acid to sixteen pints of distilled water. These proportions express volume, not weight.

A frame of iron wire upon which to place the plate, in order that it may be heated by means of a spirit lamp

Lastly, a small spirit lamp.

As already stated, these photographic delineations are executed upon silver plated on copper. The size of the plate will depend of course on the dimensions of the camera. We must begin by polishing it carefully. To accomplish this, the surface of the silver is powdered all over with the pumice, by shaking the bag without touching the plate.

Next, with some cotton dipped in a little olive oil, the operator rubs the plate gently, rounding his strokes, as represented, Fig. 2. beginning from C. During this operation the plate must be laid flat upon several folds of paper, care being taken to renew these from time to time, that the tablet be not twisted from any inequality in the support.

The pumice must be renewed and the cotton changed several times. The mortar employed for preparing the pumice must be of porphyry. The powder is afterwards finished by grinding upon polished glass, with a glass muller, and very pure water. And lastly, it must be perfectly dried. It will be readily apprehended of what importance it is to attend to these directions, since upon the high polish of the silver depends in a great measure the beauty of the future design. When the plate is well polished, it must next be cleaned by powdering it all over once more with pumice, and rubbing with dry cotton, always rounding and crossing the strokes, for it is impossible to obtain a true surface by any other motion of the hand. A little pledget of cotton is now rolled up and moistened with the diluted acid already mentioned, by applying the cotton to the mouth of the phial and inverting it, pressing gently, so that the centre only of the cotton may be wetted, and but slightly, care being taken not to allow any acid to touch the fingers. The surface of the plate is now rubbed *equally* all over with the acid applied by the pledget of cotton. Change the cotton and keep rubbing, rounding as before, that the acid may be equally spread, yet in so small a quantity as just to skim the surface, so to speak. If, as frequently happens, the acid run into small drops from the high polish, change the cotton repeatedly and break down the globules as quickly as possible, but always by gently rubbing, for if allowed to rest or run upon the plate they will leave stains. It will be seen when the acid has been properly diffused, from the appearance of a thin veil spread regularly over the whole surface of the plate. Once more powder over pumice, and clean it with fresh cotton, rubbing as before, but very slightly.

The plate is now to be subjected to a strong heat. It is placed upon the wire frame, (Fig. 1, both views,) the silver upwards. The spirit lamp is applied below the hand, moving it round, the flame touching and playing upon the copper. This operation being continued at least five minutes, a white strong coating is formed all over the surface of the silver, if the lamp has been made to traverse with proper regularity; the lamp is now withdrawn. A fire of charcoal may be used

instead of the lamp, and is perhaps preferable, the operation being sooner completed. In this latter case the wire frame is unnecessary, because the plate may be held by one corner with pincers, and so held over the fire, moving it at the same time till all is equally heated, and the veil appear as before described. The plate is now to be cooled *suddenly* by placing it on a cold substance, such as a mass of metal or stone, or best of all a marble table. When perfectly cold, it is to be again polished, an operation speedily performed, since the gummy appearance merely has to be removed, which is done by the dry pumice and cotton repeated several times, changing the cotton frequently. The polishing being thus completed, the operation of the acid is to be repeated three different times, dry pumice being powdered over the plate each time, and polished off very gently with the cotton, which must be very clean, care being taken not to breathe upon the plate or to touch it with the fingers, or even with the cotton upon which the fingers have rested, for the slightest stain upon the surface will cause a defect in the drawing.

When the plate is not intended for immediate use, the last operation of the acid is not performed. This allows any number of plates to be kept prepared up to the last slight operation, and they may be purchased in this state if required. It is, however, indispensable that a last operation by acid as described, be performed on every plate, immediately before it be placed in the camera. Lastly, every particle of dust is removed by gently cleaning the whole edges and back also with cotton.

SECOND OPERATION.

Coating the plate.

For this operation, we require :

The box represented, Figs. 7 and 8.

The small board, Fig. 3.

Four small metallic bands, the same substance as the plates.

A small handle, Fig. 5. and a box of small tacks.

A phial of iodine.

The plate is first to be fixed upon the board by means of the metallic bands with their small catches and tacks, as represent Fig. 3. The iodine is now put into the little dish, D, at the bottom of the box, Figs. 7 and 8. It is necessary to divide the iodine into pieces, in order to render the exhalation the more extensively and more equally diffused, otherwise it would form circles in the centre of the plate, which would destroy this essential requisite. The board is now fitted into its position, the plate face downwards, the whole being supported by small brackets projecting from the four corners of the box, the lid of which, G, is then closed. In this position the apparatus remains till the vaporization of the iodine, which is condensed upon the plate, has covered its surface with a fine coating of a yellow gold color. If this operation be protracted, the gold color passes into violet, which must be avoided, because in this state the coating is not so sensitive to the impressions of light. On the contrary, if the coating be too pale, the image of nature in the camera will be too faint to produce a good picture. A decided gold color—nothing more—nothing less—is the only assurance that the ground of the future picture is duly prepared

The time for this cannot be determined, because it depends upon several circumstances. Of these two the principal are the temperature of the apartment, and the state of the apparatus. The operation should be left entirely to spontaneous evaporation of the iodine—or at all events, no other heat should be used than what can be applied through the temperature of the room in which the operation takes place. It is also very important that the temperature of the inside of the box be equal to that of the air outside, for otherwise, a deposition of moisture takes place upon the plate, a circumstance most injurious to the final result. Secondly, as respects the state of the apparatus; the oftener it has been used, the less time is required, because in this case, the interior of the box being denetrated with the vapors of iodine, these arise from all sides, compensing thus more equally and more rapidly upon the surface of the plate, a very important advantage. Hence it is of consequence to leave always a small quantity of iodine in the cup, and to protect this latter from damp. Hence, likewise, it is obvious that an apparatus of this kind which has been some time in use, is preferable to a new box, for in the former the operation is always more expeditiously performed.

Since from these causes the time cannot be fixed, *a priori*, and may vary from five minutes to half an hour, rarely more, unless the weather be too cold, means must be adopted for examining the plate from time to time. In these examinations it is important not to allow the light to fall directly upon the plate. Also, if it appear that the color is deeper on one side of the plate than the other, to equalize the coating the board must be replaced, not exactly in its former position, but turned one quarter round at each inspection. In order to accomplish these repeated examinations without injuring the sensibility of the ground or coating, the process must be conducted in a darkened apartment into which the light is admitted sideways, never from the roof—the door left a little ajar answers best. When the operator would inspect the plate, he raises the lid of the box, and lifting the board with both hands turns up the plate quickly, and very little light suffices to shew him the true color of the coating. If too pale, the plate must be instantly replaced, till it attain the proper gold tone; but if this tint be passed, the coating is useless, and the operations must be repeated from the commencement of the first.

From description this operation may perhaps seem difficult, but with a little practice one comes to know pretty nearly the precise interval necessary to produce the true tone of color, and also to inspect the plate with great rapidity, so as not to allow time for the light to act.

When the coating has reached the proper tone of yellow, the plate to which it is fitted, is slipped into the frame, (Fig.13.) and thus adjusted at once in the camera. In this transference care must be taken to protect the plate from the light; a taper should be used, and even with this precaution, the operation ought to be performed as quickly as possible, for a taper will leave traces of its action if continued for any length of time.

We pass now to the third operation, that of the camera. If possible the one should *immediately* succeed the other, the longest interval between the second and third ought not to exceed an hour. Beyond this

space the action of the iodine and silver no longer possesses the requisite photogenic properties.

Observanda.—Before making use of the box, the operator should clean it thoroughly, turning it bottom upwards, in order to empty it of all the particles of iodine which may have escaped from the cup, avoiding at the same time touching the iodine with the fingers. During the operation of coating, the cup ought to be covered with a piece of gauze stretched on a ring. The gauze regulates the evaporation of the iodine, and also prevents the compression of the air on the lid being shut from scattering the particles of iodine, some of which reaching the plate, would leave the large stains on the coating. For the same reason the top should always be let down with the greatest gentleness, not to raise the dust in the inside, the particles of which being charged with the vapor of the iodine, would certainly reach and damage the plate.

THIRD OPERATION.

The Camera.

The apparatus required in this operation is limited to the camera obscura. (Figs. 14 and 15.)

This third operation is that in which by means of light, acting through the camera, nature impresses an image of herself on the photographic plate, enlightened by the sun, for then the operation is more speedy. It is easy to conceive that this operation, being accomplished only through the agency of light, will be the more rapid in proportion as the objects, whose photographic images are to be delineated, stand exposed to a strong illumination, or in their own nature present bright lines and surfaces.

After having placed the camera in front of the landscape, or facing any other object of which it may be desirable to obtain a representation, the first essential is a perfect adjustment of the focus, that is to say, making your arrangements so as to obtain the outlines of the subject with great neatness. This is accomplished by advancing or withdrawing the frame of the obscured glass which receives the images of natural objects. The adjustment being made with satisfactory precision, the moveable part of the camera is fixed by the proper means, and the obscured glass being withdrawn, its place is supplied by the apparatus, with the plate attached as already described, and the whole secured by small brass screws. The light is of course all this time excluded by the inner doors; these are now opened by means of two semi-circles (see illustration) and the plate is disposed ready to receive its proper impressions. It remains only to open the aperture of the camera, and to consult a watch.

This latter is a task of some nicety, as nothing is visible, and as it is quite impossible to determine the time necessary for producing a design, this depending entirely on the intensity of the light on the objects, the imagery of which is to be reproduced. At Paris, for example, this varies from three to thirty minutes.

It is likewise to be remarked, that the seasons as well as the hour of the day, exert considerable influence on the celerity of the operation. The most favorable time is from seven to three o'clock; and a draw-

ing which, in the months of June and July at Paris, may be taken in three or four minutes, will require five or six in May or August, seven or eight in April and September, and so on in proportion to the progress of the season. These are only general data for very bright or strongly illuminated objects, for it often happens that twenty minutes are necessary in the most favorable months, when the objects are entirely in shadow.

After what has just been said, it will readily occur to the reader that it is impossible to specify with precision the exact length of time necessary to obtain photographic designs; practice is the only sure guide and with this advantage, one soon comes to appreciate the required time very correctly. The latitude is of course a fixed element in this calculation. In the south of France, for example, and generally in all those countries in which light has great intensity, as Spain, Italy, &c: we can easily understand that these designs must be obtained with greater promptitude than in more northern regions. It is, however, very important not to exceed the time necessary, in different circumstances, for producing a design, because, in that case, the lights in the drawing will not be clear, but will be blackened by a too prolonged solarization. If, on the contrary, the time has been too short, the sketch will be very vague, and without the proper details.

Supposing that he has failed in a first trial, by withdrawing the tablet too soon, or by leaving it too long exposed, the operator, in either case, should commence with another plate immediately; the second trial, being corrected by the first, almost insures success. It is even useful, in order to acquire experience, to make some essays of this kind.

In this stage of the process, it is the same as for the coating; we must hasten to the next operation. When the plate is withdrawn from the camera, it should immediately be subjected to the subsequent process; there ought not, to be at most a longer interval than an hour between the third and fourth operations; but one is always surest of disengaging the images when no space has been allowed to intervene.

FOURTH OPERATION.

Mercurial or disengaging process.

Here are required:

A phial of mercury, containing at least 3 oz.

A lamp with spirit of wine.

The apparatus represented by Figs. 16, 17, and 18.

A glass funnel with a long neck.

By means of the funnel the mercury is poured into the cup *C* at the bottom of the larger vessel. The quantity must be sufficient to cover the bulb of a thermometer *F*. Afterwards, and throughout the remaining operations, no light save a taper can be used.

The board with the plate affixed is now to be withdrawn from the frame already described as adapted to the camera, and figured Fig. 13. The board and plate are placed within the ledges of the black iron vessel Fig. 16, at an angle of 45° the tablet with sketch downwards, so that it can be seen through the glass *G*. The top *A* is then gently put down, so as not to raise up particles of the mercury.

When all things are thus disposed, the spirit lamp is lighted, and placed under the cup containing mercury. The operation of the lamp is allowed to continue till the thermometer, the bulb of which is covered by the mercury, indicates a temperature of 60° centigrade. The lamp is then immediately withdrawn; if the thermometer has risen rapidly, it will continue to rise without the aid of a lamp, but this elevation ought not to exceed 75° centigrade.

The impress of the image of nature exists upon the plate, but it is invisible. It is not till after the lapse of several minutes that the faint tracery of objects begins to appear, of which the operator assures himself by looking through the glass G, by the light of a taper, using it cautiously that its rays may not fall upon, and injure the nascent images of the sketch. The operation is continued till the thermometer sink to 45° centigrade; the plate is then withdrawn, and this operation completed.

When the objects have been strongly illuminated, or when the action in the camera has been continued rather too long, it happens that this fourth operation is completed before the thermometer has fallen even to 55° centigrade. One may always know this, however, by observing the sketch through the glass.

It is necessary after each operation to clean the inside of the apparatus carefully, to remove the slight coating of mercury adhering to it. When the apparatus has to be packed for the purpose of removal, the mercury is withdrawn by the small cock E, inclining the vessel to that side.

One may now examine the sketch by a feeble light in order to be certain that the processes hitherto have succeeded. The plate is now detached from the board, and the little bands of metal which held it there are carefully cleaned with pumice and water after each experiment, a precaution rendered necessary from the coating both of iodine and of mercury which they have acquired. The plate is now deposited in the grooved box (Fig. 9.) until it undergoes the fifth and last operation. This may be deferred if not convenient; for the sketch may now be kept for months in its present state without alteration, provided it be not too frequently inspected by the full daylight.

FIFTH OPERATION.

Fixing the impression.

The object of this final process is to remove from the tablet the coating of iodine, which, continuing to decompose by light would otherwise speedily destroy the design when too long exposed. For this operation the requisites are:

A saturated solution of common salt, or a weak solution of hyposulphite of pure soda.

The apparatus represented Fig. 19, first and second views.

Two square troughs, sheet copper, Fig. 21, both views.

A vessel for distilled water, Fig. 23.

In order to remove the coating of iodine, common salt is put into a bottle with a wide mouth, which is filled one-fourth with salt, and three-fourths with pure water. To dissolve the salt, shake the bottle, and when the whole forms a saturated solution, filter through paper. This solution is prepared in large quantities beforehand, and kept in corked bottles.

Into one of the square troughs, pour the solution, filling it to the height of an inch; into the other pour in like manner the water. The solution of salt may be replaced by one of hyposulphite of soda, which is even preferable, because it removes the iodine entirely, which the saline solution does not always accomplish, especially, when the sketches have been laid aside for some time between the fourth and fifth operations. It does not require to be warmed, and a less quantity is required.

First, the plate is placed in common water, poured into a trough, plunging and withdrawing it immediately—the surface merely requiring to be moistened—then plunge it into the saline solution, which latter would act upon the drawing if not previously hardened by the washing in pure water. To assist the effect of the saline solutions, the plate is moved about in them by means of a little hoop of copper wire, Fig. 22. When the yellow color has quite disappeared, the plate is lifted up with both hands, care being taken not to touch the drawing, and plunged again into the first trough of pure water.

Next, the apparatus, Fig. 19, (two views) and the bottle Fig. 23, having been previously prepared, made very clean, and the bottle filled with distilled water, the plate is withdrawn from the trough, and being instantly placed upon the inclined plane, Fig. 19, distilled water, hot, but not boiling, is made to flow in a stream over its whole surface, carrying away every remaining portion of the saline wash.*

Not less than a quart of distilled water is required when the design is of the dimensions indicated in the engraving, $8\frac{1}{2}$ by $6\frac{1}{2}$ inches. The drops of water remaining on the plate must be removed by forcibly blowing upon it, for otherwise in drying they would leave stains on the drawing. Hence also will appear the necessity of using very pure water, for if, in this last washing, the liquid contain an admixture of foreign substances, they will be deposited on the plate, leaving behind numerous and permanent stains. To be assured of the purity of the water, let a drop fall upon a piece of polished metal; evaporate by heat, and if no stain be left the water is pure. Distilled water is always sufficiently pure without this trial.

After this washing the drawing is finished; it remains only to preserve it from the dust and from the vapors that might tarnish the silver. The mercury by the action of which the images are rendered visible, is partially decomposed; it resists washing, by adhesion to the silver, but cannot endure the slightest rubbing.

To preserve the sketches then, place them in squares of strong paste-board, with a glass over them, and frame the whole in wood. They are thenceforth unalterable even by the sun's light.

In traveling, the collector may preserve his sketches in a box similar to the one Fig. 9, and for greater security may close the joints of the lid† with a collar of paper. It is necessary to state that the same

* If hyposulphite has been used, the distilled water need not be as so hot as when common salt has been employed.

† The author made attempts to preserve his sketches by means of different varnishes obtained from succinum, copal, india rubber, wax, and various resins; but

plate may be employed for several successive trials, provided the silver be not polished through to the copper. But it is very important after each trial to remove the mercury immediately, by using the pumice powder with oil, and changing the cotton frequently during the operation. If this be neglected, the mercury finally adheres to the silver, and fine drawings cannot be obtained if this amalgam be present. They always in this case want firmness, neatness, and vigor of outline and general effect.

EXPLANATION OF THE APPARATUS USED IN THE PROCESS.

The translator would add from his own experience, that two requisites are indispensable in these experiments: exquisite polish of the plate, and extreme cleanliness in all the operations; dust and stains on the tablet make large blanks in the drawing.

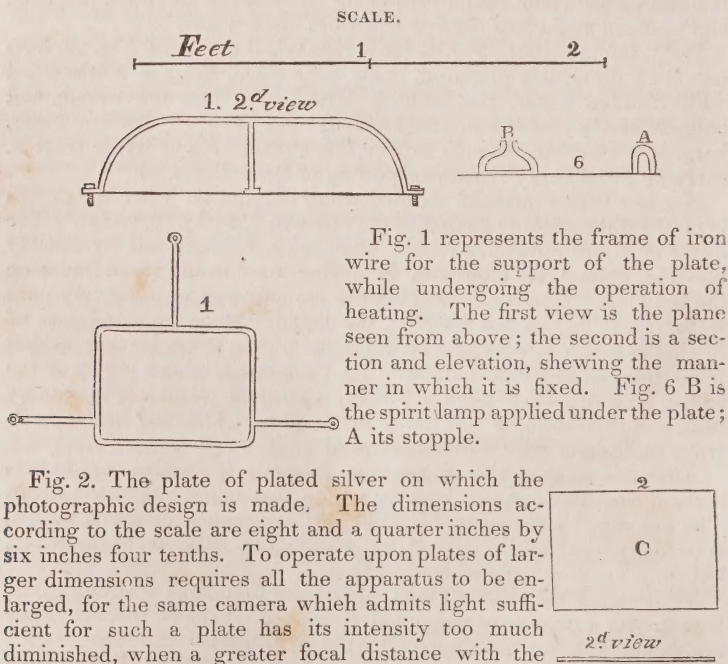


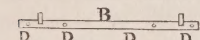
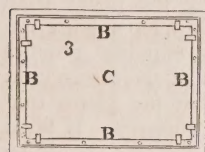
Fig. 2. The plate of plated silver on which the photographic design is made. The dimensions according to the scale are eight and a quarter inches by six inches four tenths. To operate upon plates of larger dimensions requires all the apparatus to be enlarged, for the same camera which admits light sufficient for such a plate has its intensity too much diminished, when a greater focal distance with the

he has observed, that by the application of any varnish whatsoever, the lights in these sketches were considerably weakened, and at the same time the deeper tones were hidden. To this disadvantage, was added the still greater injury from the decomposition of the mercury by all the varnishes tried; this effect, which did not become apparent till after the lapse of two or three months, terminated in a total destruction of the forms of the objects represented. Even had this not been the case, the author would have deemed it a sufficient reason for rejecting all varnishes, that they injured the vigor and clearness of the lights. The quality most to be desired in the new art is this intensity of tone in the contrast of the lights and shadows.

same aperture, and consequently same number of rays, spread over a larger surface. In polishing the plate, begin at C, and strike circularly outwards to the circumference. Vary the direction, however, and

invert the process. Always press lightly and evenly. Fig. 2, 4 second view, is the plate seen edgewise: the lines represent (nearly) its thickness. Fig. 4, muslin bag, with pumice powder.

Fig. 3. The little board or wooden tablet upon which the plate is fixed for the succeeding operations after the first one of polishing. It



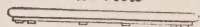
is attached by means of four fillets, B B B B, exactly the same material as the plate itself. To each of these are soldered two small projecting pieces, which embrace the plate near the corners, and the whole apparatus is retained in position by small nails, or better, screws through holes in the fillets, and inserted by the handle or turn screw, Fig. 5. The purpose of the fillets is not solely to

fix the plate, their more important use is to serve as a kind of frame to it, while undergoing the second process; the application of the iodine: without these, the cooling of iodine would not be equally diffused, for the vapor would condense

more rapidly along the edges, and consequently, the coating would be too thin in the centre and too thick round the circumference. It is perhaps not easy to explain so as to satisfy all; but the experimental part is not the less certain. Fig. 3, second view, thick-

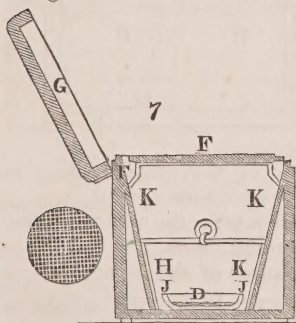


2d view



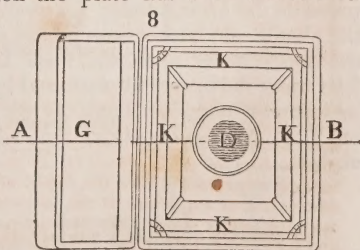
ness of the board.

Fig. 7. Section of the box for iodine, used in the second operation.



The section is supposed to pass down the middle of the apparatus by the line A B, Fig. 8, which represents the same seen from above. C is a small lid, which fits accurately the interior, dividing the whole into two chambers. It is used at all times, except when the operator is actually employed in coating the tablet. Its use is to concentrate the vapor of the iodine, and preserve the whole in a state for equally and rapidly diffusing the vapor, when the plate has been introduced.

D is the capsule or little cup in which the iodine is placed. E the small board with the plate attached, face downwards. Four small projecting supports, F, receive the four angles and retain the plate in the most favorable position for receiving the vaporization of the iodine as it rises upwards. Of course the cover C is withdrawn. G is the



box lid, always shut, except when the plate is to be withdrawn for examination. H supports for C. K, tapering sides all round, forming a funnel-shaped box within the other; the funnel-shaped interior diffuses the vapors of iodine, which thus spread as they rise. J, circle of gauze, stretched over a ring, and placed upon the cup with the iodine. The vapor of which rising through this light covering flows up equally, and not in clouds, also the gauze prevents the particles of this substance from flying about and probably injuring the plate.

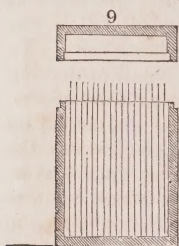
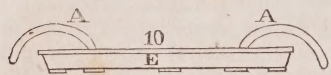


Fig. 9. Case for preserving the plates from injury, either before or after they have been impressed with images. They slip into grooves formed into two opposite sides of the case, and at some little distance apart, so that the plates cannot touch in any part of their surfaces. If filled with plates, that have designs, the case should be wrapped in paper, or better, cloth, to preserve them from dust and light. In traveling, this precaution is always necessary.

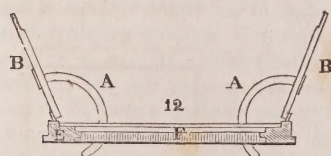
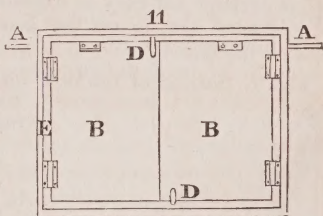


Figs. 10, 11, 12, and 13, represent four different positions of the frame into which the plate with its wooden

tablet is put, on removal from the iodine process. The object of the apparatus is twofold:—to adapt the plate to the camera obscura, and to protect the iodine coating from the action of light to the moment in which it receives the focal image.

A, Half circles which open and shut the doors, B B.

C, Fig. 13. The plate with its wooden tablet fitted into the frame:



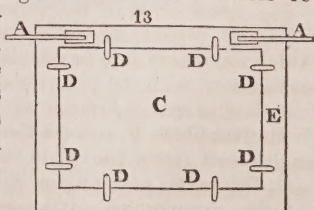
back view of the *plate* fronting inwards, the door shut upon it.

D, screws to fix the tablet and plate and to stop the doors.

E, thickness of the frame.

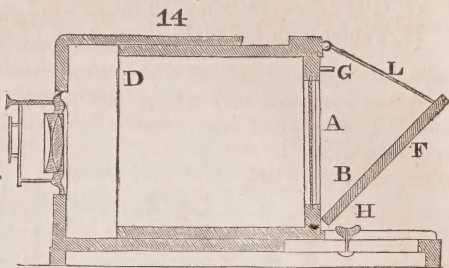
F, Fig. 12. Plate: the whole re-

presents the arrangement for receiving the photogenic impressions on the plate, the doors being open, the focal image falls upon the prepared plate, and leaves its impress penciled there by the rays of light proceeding from the natural objects.



The camera obscura, as adapted to photogenic delineation is shown Fig. 14, which is a perpendicular section lengthways.

A, a ground glass by which the focus is adjusted. It is then removed, and the photographic plate substituted, as in C, Fig. 15. B, a mirror for observing the effect of objects, and selecting points of view. For these purposes it is inclined at an angle of 45° , by means of the support L. To adjust the focus, the mirror is put down altogether, and the ground glass A used. The



focus is easily adjusted by means of the sliding frame, as represented in the plate, placing the screws on the double box D, and the projection E: when the focus is adjusted, it is fixed in position by the screw H. The mirror is retained in its place by hooks at F, which catch the eyes at G.

The object glass is achromatic and periscopic. Its diameter is 21 millimetres, and its focal distance 38 centimetres. In Eng. measure, $\frac{21 \times 38}{1900}$ in. and $\frac{38 \times 39}{100}$ in. which can easily be reduced.

This instrument has the disadvantage of reversing the objects. This can indeed be easily obviated by substituting another mirror outside, as K J, Fig. 15. This arrangement, however, injures the effect on the photographic plate from the

loss of light. It is therefore not to be employed unless when the operator has time to spare. It increases the time of the operation by one-third of the whole.

Figs. 16, 17, and 18 represent three views of the same apparatus—that used for the fourth operation—submitting the plate to the vapor of mercury.

Fig. 16. Section of the apparatus.

Fig. 17. Front view of the same.

Fig. 18. Right side in which the thermometer is placed.

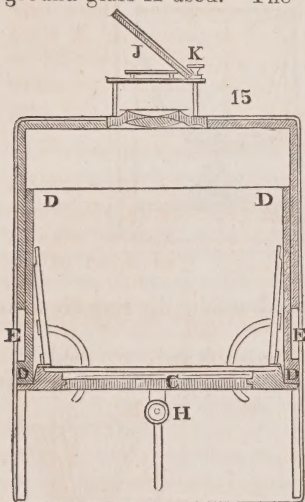
A, Lid of the apparatus.

B, Blackboard with grooves to receive the small board and plate.

C, Cup containing mercury.

D, Lamp with spirit of wine.

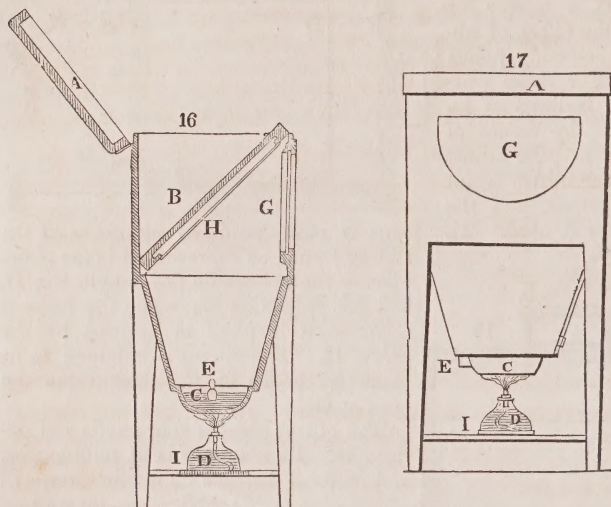
E, Small cock inserted at an angle, through which the mercury is withdrawn after the operation.



F, Thermometer.

G, Glass through which to inspect the operation.

H, Tablet with the plate as removed from the camera.



I, Stand for the spirit lamp which is placed within the ring N, so as to be under the centre of the cup.

All the interior of this apparatus should be black and varnished.

Figs. 19, 20, 21, 22 and 23, represent various apparatus for the last operation of washing the plate.

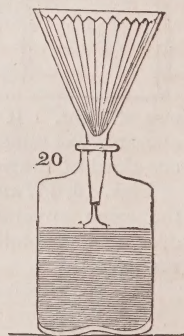
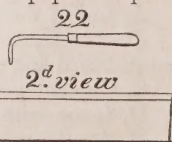
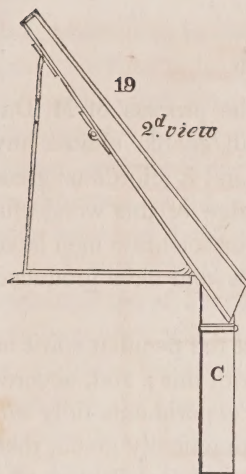


Fig. 20. Funnel with plate of paper for purifying the saline wash of salt or hyposulphite of soda.

Fig. 21. Trough of tinned copper, in the bottom of which is represented one of the plates in the act of being washed. Two such troughs must be prepared





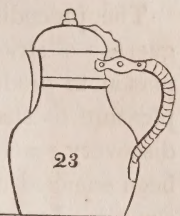
one for salt—the other for distilled water.

Fig. 22. Little hook for shaking the plate while in the wash.

Fig. 19. Apparatus in japanned white iron for washing the designs.

E, well for receiving the water that flows through the tube C.

Fig. 23. Bottle with wide mouth serving to warm the distilled water and to pour it upon the plate when placed as at B, Fig. 19.



IMPROVEMENTS IN THE DAGUERRETYPE.—At the late meetings of the Academy of Sciences, much attention has been given to the various improvements made in the Daguerreotype, which instrument seems to have attracted the very active notice of scientific men in general. In the first place, the Baron Seguiet exhibited an instrument of this kind constructed by himself, but with ingenious modifications, having for their objects, diminution in size and weight, and the simplification in other respects of the entire apparatus. M. Seguiet expressed himself satisfied that several of the conditions, which have been announced as required for the success of the process, may be dispensed with; and stated his intention of devoting himself to a still further simplification of the apparatus, so as, at least, to make it more portable, more easy of use, and less expensive. His improvements have likewise been directed to rendering the operations of photography practicable in the open country, even those delicate ones, which seem at present to require protection against too strong a light. M. Arago afterwards laid before the academicians an objective glass, constructed by M. Cauche, with the view of *redressing* the image obtained in the Daguerreotype, which is now presented *reversed*, a circumstance that, in many cases, destroys the resemblance of places and monuments. The Abbé Moignat gave an account of experiments made by himself, in conjunction with M. Soleil, for the purpose of introducing the light of oxy-hydrogen gas, as the principle of illumination to the objects intended to be represented by the instrument. As yet, these experiments have been unsuccessful; but M. Arago does not consider the results hitherto obtained as decisive against the light in question, when applied to the plate itself, instead of the objects to be rendered. A report has also been made on the results of a process, by which M. Bayard is enabled to take impressions on paper. This discovery is described as important; but, as the process is kept secret, we are unable to say how far it differs from, or is an improvement on, that of Mr. Fox Talbot.

OBSERVATIONS.

The preceding pages describe fully the process of M. Daguerre—a strict adherence to which will enable almost any person to produce beautiful specimens; and it affords us great pleasure to state that, since the knowledge of this wonderful discovery reached this country, some of our scientific men have been engaged in repeating the experiments, and have produced some good results.

It could not, however, be supposed that the peculiar spirit of American enterprise would rest satisfied with this; and, accordingly, no sooner had those engaged in the experiments fully satisfied themselves that the process was practically given, than they almost immediately conceived it possible to effect similar results by more simple and less expensive means; and we are happy to state that the results of their experiments have established the following facts, viz:—

1. That instead of the costly combination of glasses, recommended by M. Daguerre, a single Meniscus glass has produced as exact and brilliant results as we have yet seen, and requires less time.

2. From a number of experiments it has been proved, that the use of dilute nitric acid can be dispensed with, as several fine proofs have been produced without its use. This renders the process much more simple; for the application of the acid has heretofore been considered one of the nicest points in the preparation of the plate, as, if it be unequally applied, it prevents the plate from acquiring the uniform golden color when exposed in the iodine box. In dispensing with the use of nitric acid, all that is required is to finish the polish of the plate, with dry, well levigated, and washed rotten stone; after which, the plate should be carefully rubbed off with dry cotton.

3. The iodine box, recommended by M. Daguerre, is entirely too deep, for it requires from 15 to 30 minutes exposure of the plate before the proper color is produced. The box should be about four inches deep, with a tray, an inch deep, that will fit into the bottom of it. Upon this tray the iodine is to be spread, and then covered with a double thickness of fine gauze, or vel-

vet, which is to be tacked to the upper edge of the tray; supports are then to be fastened in each corner of the box, at such a height as that the plate can be lowered to within an inch of the gauze. A box constructed on this plan will produce the proper golden color, on the plate, in one or two minutes. This modification of the iodine box was suggested by Mr. Seager, who has used it satisfactorily for some time past.

4. The ingenuity displayed by some of our mechanics in the manufacture of the plates, gives us every reason to believe that, ere long, they will be furnished with almost the requisite polish, at a reasonable price. Should they succeed in doing this, it will save the experimenter several hours of manual labor, in the preparation of the plate, as nothing then will be required but the finishing polish, with prepared rotten stone, mentioned above.

TABLE OF GENERAL RULES FOR EXPOSURE
OF THE PLATE IN THE CAMERA, IN TAKING EXTERIOR VIEWS.

The following table is compiled partly from observation, and partly from analogy, and applies only to the period from the month of October to February. The observations were made upon ordinary city views.

STATE OF THE WEATHER.	HOURS OF THE DAY.						
	8	9	10	11 to 1	1 to 2	2 to 3	3 and after
	MINUTES.	MINUTES.	MINUTES.	MINUTES.	MINUTES.	MINUTES.	MINUTES.
Very brilliant and clear, wind steady from W. or N. W., very deep blue sky, and absence of red rays at sunrise or sunset. Time employed.....	15	8	6	5	6	7	12 to 30
Clear, wind from S. W., moderately cold, but a slight perceptible vapor in comparison with above. Time employed.....	16	12	7	6	7	8	15 to 40
Sunshine, but rather hazy, shadows nohard, nor clearly defined. Time employed.....	25	18	14	12	14	16	25 to 40
Sun always obscured by light clouds, but lower atmosphere, clear from haze and vapor. Time employed.	30	20	18	16	15	20	35 to 50
Quite cloudy, but lower atmosphere, free from vapors. Time employed.....	50	30	25	20	20	30	50 to 70

It is impossible, at present, to state precisely the time required

to expose the plate in the camera at all seasons of the year ; but the preceding table, drawn up by Mr. D. W. Seager, of this city, and which coincides in general with the observations of others, may prove useful as a guide to experimenters. The time will necessarily decrease as the summer months approach. Much, however, depends upon the selection of the view ; a white marble edifice, for instance, requires less time than darker buildings.

Ed.

THE DAGUERREOTYPE. M. Jobard, who forwarded to the exhibition the first view, taken in Belgium, with the Daguerreotype, has just exhibited the *first portrait* taken from the life. It represents a young female dressed in white, sleeping under a canopy ; the material and embroidery of the pillows on which she reclines are rendered with exquisite nicety, as well as the hand and the side of the face on which the *light* rests. This proves that small *tableaux de genre* in the style of Deveria, might be produced by the machine, which could not fail to possess some beauty. One precaution, however, would be necessary, *not to drown the figures in a flood of light.*

RIVAL TO THE DAGUERREOTYPE. If we believe the German papers, one Leipmann, of Berlin, has invented a machine for obtaining correct copies of oil colored pictures. For some years a little slender man, whose dress denoted poverty, was observed in the museum of Berlin, every week, stationed before a portrait of Rembrandt, with his eyes fixed upon the picture. It was M. Leipmann, meditating upon the invention of a machine for reproducing oil paintings ; and, after ten years of persevering labor, he has succeeded. He has produced with his machine in one of the rooms of the Royal Museum, and in presence of the directors, one hundred and ten copies of Rembrandt's portrait, painted by himself, a picture, the copying of which in the usual way presents the utmost difficulties. The copies are said to be perfect, and to give the most delicate shades of the color. He asks but a louis d'or for a copy.

Bury Post.

The King of Prussia has honored Leipmann with the following communication on that ingenious artist's submitting to his Majesty a specimen of his invention for the copying of oil paintings :

"I have not only heard for some time past of your invention for the printing of oil paintings, but have also convinced myself of its importance by the copy of Rembrandt's portrait, which you have submitted to me. I expect a more circumstantial report upon your invention from the minister of public instruction ; but, in the meantime, I have ordered two hundred dollars to be presented to you, in acknowledgment of your merit, and shall with pleasure keep the copy you have submitted to my inspection. (Signed)

Berlin, Sept. 10, 1839.

FREDERICK WILLIAM.

EFFECTS OF LIGHT ON COLOR. Mr. Trull exhibited certain tapestries of Raffaele, in the Haymarket, some time ago. Mr. Professor Faraday, suggested that the application of sunlight would restore the colors and the prophecy has been fulfilled to a miracle. 'A renewed freshness,' says Mr. Trull, 'now reigns over the whole, and the clearing up of the light in many of the landscape parts is most extraordinary, giving a depth and breadth the cartoons themselves do not now convey; particularly in the 'Keys to St. Peter,' 'St. Paul at Athens,' and 'the death of Annanias, where extensive landscapes, ranges of buildings, and foliage, have sprung up like magic on parts quite obscured when up in London, eight months back, much of which is either worn or torn out of Raphael's patterns at Hampton, and painted over, and known only through the means of these Leo Tapestries.' And again: 'Some colors entirely changed, others in confusion and apparently gone, yet by the mere effects of light and air, slowly and quietly resume the principal of their original tints! Flesh re-appears, hair on the head starts up: the grand muscular effect and unique power of expression, only found in Raphael and Michael Angelo, are finely developed, where a few months back appeared a plain surface! Here are the works, and the facts may be now ascertained.'

THE TYPOFACE. The Bordeaux papers mention that a young sculptor of that city had discovered a method of taking casts of the human face, which, without requiring that the features should be reduced to a state of perfect rigidity, allows them to preserve all their natural play, and thus produces an exact resemblance, with the animation of life. His name is Pellet, and he designates his apparatus the *Typoface*.

THORWALDSEN. This great sculptor, who has recently completed some mythological bas-reliefs, is at present occupied with a bust of Holberg, and when that is finished, will undertake, for the Baroness Stampe, a statue of himself in marble. The sculptor is now residing at the beautiful estate of that lady, where she has built an *atelier* for his use. He has lately visited Hamburg, and made many short excursions in the neighborhood, which have resembled a continued triumph. Wherever he went he was received with processions, speeches, and all the usual manifestations of respect and pleasure; peasants, it is said, came many miles to see him, and landlords refused to accept payment for the refreshment furnished on these occasions; a proof how far his popularity has extended among the people, however imperfectly the grounds on which it rests may be understood.

Atheneum.

SIR DAVID WILKIE. We understand that Sir David Wilkie, during his late northern tour, spent some time at Arbuthnott House, where he was engaged in taking a full length picture of Viscount Arbuthnott. This work of art, which has been subscribed for by the landed proprietors and tenantry of the county of Kincardine, of which his lordship is Lord Lieutenant, will adorn the County Hall at Stonehaven.

STEAM AND ITS APPLICATIONS.

Steam Carriage for common roads. An experimental trip was made in Mr. Hancock's steam carriage as far as the eight mile stone on the Barnet road, under the patronage of Sir James Gardiner, and several gentlemen connected with, and interested in, scientific matters. The start took place at eleven o'clock from Finsbury square, and for a considerable portion of the distance affairs proceeded as well as could be desired. Eventually, however, it was discovered that part of the machinery was out of order, in consequence of the patentee, from pressure of business, as it was stated, not having taken the necessary preliminary precaution of overhauling the whole of its intricate works. The experiment, therefore, as to its first intention, proved a failure. The defect, nevertheless, was, to an extent, remedied, and the return to London accomplished within a very short space of time. Notwithstanding the comparative failure in the object of the day, it is but just to the inventor to declare, that the obstacles which a large portion of the scientific world had asserted to be insurmountable by means of a locomotive power on the road, namely, the ascent of hills or the obtaining a controlling command in making a descent, was by Mr. Hancock, on the occasion, proved to be visionary. The rate made going up the the Highgate Archway, and other hills, was nearer seven than six miles in the hour, whilst that in descending was regulated at the will and pleasure of the conductor.

Standard

We are happy to state that since the above experiment Mr. Hancock has succeeded in performing the trip from London to Cambridge in four hours and a half-distance 52 miles. ED.

Improvement in Steam Engines. At the port of Toulon, preparations are being made for trying an important modification of the crank of steam engines for vessels, suggested by a naval officer. This modification consists in rendering the cranks fixed, or moveable at pleasure, by means of a curb (*freni*) similar to those employed for trying the power of the engines. If the experiment, which is to be tried on the Styx, succeed, the paddle wheel will become, at will, independent of the engines, without the necessity for employing a complication of machinery, which hitherto has been more ingenious than useful.

Inventors' Advocate.

Steam Power in Birmingham. The steam power employed in Birmingham is, at the present time, 3436 horses' power, of which 2155 horses' power is employed in the metal trade of the town. The number of steam engines is 240, of which sixty-five are high pressure, and the remainder condensing engines. In the first thirty five years after the introduction of steam power, only forty-two engines were set to work; in the next fifteen years, seventy-eight were erected; and in the last eight years one hundred and twenty have been established. The consumption of coal is estimated at two hundred and forty tons per day.

Scotsman.

Steam Power in France. The Commerce has a long and interesting article upon steam power in France, from which the following is extracted.

In 1820, the number of stationary steam engines in France was only 60, of 1024 horse power collectively; from 1820 to 1830 very few new engines were added annually; but in 1833 there was an addition of 156; in 1834, 199; in 1835, 262; in 1836, 324; and in 1837, 234. At the end of 1837 the total number of stationary steam engines in France was 1969, with a collective power of 26,186 horses; of this number 555 were employed in cotton factories, 118 in forges and foundries, and the rest in sugar refineries and establishments of different kinds; of these engines about three fourths were high or mean pressure, these being preferred in France on account of the high price of coals, a high pressure engine consuming about 8lbs. of coals per horse and per hour, and a low pressure engine 10lbs. Seven eighths of the engines were of French manufacture. The number of engines in French steamboats at the end of 1837 was one hundred and fifty in one hundred and twenty-four boats. The greatest power on board of any boat was one hundred and eighty horse power—two engines of ninety each; but the Neptune and the Rotterdam, of Havre, the one a towing and the other a passage boat, had each an engine of one hundred and forty horse power. Seventy-nine of these steamers were employed as passage boats, twenty-two for passengers and merchandise, and thirty-three as tow boats and transports. The total amount of power in the one hundred and twenty-four steamers was 5,408 horses. On railways the locomotive engines amounted to twenty in the departments of the Loire and the Rhone, and twenty-seven in the Seine; giving altogether 1210 horse power. At first all the locomotives were of English manufacture, but latterly two thirds are French. The total steam movement in France up to 1838, was:

Stationary engines.....	1969.....	horse power.....	26,127
Steamers	150.....	".....	5,408
Locomotives.....	47.....	".....	1,210
	2,166		32,745

Since 1837, a great many large engines have been made for government steamers, and the locomotives for railways must have been doubled in number; but in consequence of the distressed state of trade, the number of stationary engines has not increased in so large a proportion as before. The Commerce, whilst it admits that until lately the steam engines made in France were not equal to the English, contends that they are now quite as good; but the best proof to the contrary is, that the repairs of the French low-pressure engines cost twice as much as those of the English. As to the high pressure, the repairs are so expensive as to be almost equivalent to the saving of coals.

The Anthracite Steam Vessel.—It has been considered an object of much importance to bring into use the extensive field of coal which exists in South Wales, known by the name of the "anthracite or stone coal." This has been, hitherto, only partially used, and for some very inconsiderable purposes, such as the burning of lime, malting, and, in some few isolated instances, for steam engines in Wales and in Corn

wall ; but, within the last few years, a number of attempts have been made to use it in the manufacture of iron. These were, at length, successfully carried into effect at Mr. Crane's works, at Ynischedwyn, by Mr. E. Manby, and since then, he has formed several establishments where iron of a very superior quality has been made. These results have induced a party of gentlemen, who are interested in the mineral districts, to form a company for extending the use of this fuel. They have caused an iron vessel to be built by Mr. Penn, of Greenwich, on the exact model of the iron boats now plying on the Thames, and have applied the same power of engines, and restricted them to the same external dimensions of boiler, as in the usual vessels. To this they have adapted the improvements patented by Mr. Player, and executed under the joint directions of that gentleman and Mr. Manby. This vessel has been running, for the last few days, on the Thames, and yesterday we had the satisfaction of witnessing her complete success, as far as demonstrating the power of raising steam by this fuel, which has hitherto been objected to from its slow combustion, arising from its not containing any bitumen. The dimensions of the vessel are about ninety-five feet long, thirteen feet six inches breadth of beam with a draught of water of two feet. The engines are of the power of twenty-four horses collectively. They are on the principle of the vibrating cylinder, and, *en passant*, we would commend them for their smooth action; and, being fixed to a strong frame which is nearly isolated from the vessel, there is an absence of that tremulous motion which, in general, is so annoying in steam vessels. The principle of the boilers is, to prepare the fuel for combustion by passing it through a hopper which traverses the boiler, and, falling upon the centre of the fire, keeps it continually supplied with the coal partially charred, so as to prevent the decrepitation which has hitherto prevented, in many instances, the use of this fuel. The hopper is kept filled from the level to the top of the boiler, and thus avoids the scorching labor of the poor stokers, whose melting toil we have so often lamented. During the day voyages, the fire-doors in the engine-room were never opened except to examine the working of the principle, and the supply of steam was, in spite of the smallness of the boiler, ample for the engines. The speed attained, when once clear of the incumbrances of the Pool, was from eleven to twelve miles per hour; and, in a longer voyage, when the engines had got their bearing, this speed may well be reckoned upon. The great distinguishing mark of the Anthracite, which is the appropriate name of the vessel, is the total absence of the pennon of black smoke vomited forth from the chimney of the ordinary steamers, to the annoyance of the frequenters of the river and the inhabitants of its banks.

Morning Post.

Anthracite coals have been used in this country, for some years, with the greatest success, both for steam boats and locomotive engines. The Baltimore and Washington railroad company were the first to introduce its use for locomotives. We do not know of any stationary engine in this city, in which other fuel is used.

Ed.

The capital invested in steam vessels in England, is about £8,000,000. The steamers belonging to Britain amount to 850 or 900, comprising about 170,000 tons, and 70,000 horses' power.

Power of Steam.—The greatest load lifted by any engine now at work in this country was by one in the consolidated mines, which raised a load of 90,000 lbs. every double stroke it made, and did this nine times a minute, amounting to 567,022 tons, lifted 7 ft. 6 in. in 24 hours; and this astonishing machine could be started, stopped, or regulated by a little boy.

Mechanics' Magazine.

Large deductions should probably be made from the published statements of work performed by the Cornish engines. The usual method of calculation is to give the contents of the pump barrels as *full*, for each stroke, and by calculating the weight of water, decide the load raised. It is well known that a quantity of atmospheric air, but not sufficient to destroy the vacuum is admitted into the pump barrel at each stroke, for the purpose of preventing the large pistons from striking the water too harshly; and no allowance appears to have been made for the space it occupies.

ED.

Steam towing on Canals.—The recent important improvements, which have been made on this subject, upon the suggestion and under the direction of Mr. Macneill, C. E. were again repeated by him on the Forth and Clyde Canal, on the 10th and 11th instant. On the latter day they were carried on upon a more extended scale, in the presence of the governor, deputy governor, council, manager, and a great many of the proprietors of the company, several of whom had come from London, Liverpool, &c. expressly for the purpose. Besides these gentlemen, there was a large number of persons assembled, anxious to witness this harvest of new facts, pregnant with important consequences to the commerce of the country, and so deeply interesting in a scientific point of view. The locomotive employed was the *Victoria*, the same engine that had been used in the former trials. By her were towed both the passenger boats, and the larger vessels of the canal trade, under a variety of conditions. Some of the most remarkable results were as follows:

With a passenger boat laden with passengers (an average load,) a rate of twenty miles per hour was attained, and it was evident that the only limit to the speed was that of the power of the engine. The following eight trading vessels were arranged in a line, attached to each other and the first to the locomotive:

	Tons register.	Actual load.	Tons.	Draught of water,
Thetis, Grangemouth.....	66	35	.....	8 ft. 0 in.
Alert, Leith	41	67	.....	8 9
Union, Kirkaldy.....	48	65	.....	8 6
Carried forward,	155	167		

	Tons register.	Actual load. Tons.	Draught of water.	
Brought forward,	155	167	24 ft. 15 in.	
Thistle, Alloa.....	51.....	18.....	6	0
Dainty Davy.....	30.....	47.....	7	10
London Packet.....	81.....	70.....	8	10
Star (Scow).....	0.....	40.....	4	0
Prince (luggage boat)	0.....	22.....	4	6
	317	364		

For the haulage of this amount of tonnage, at the usual rate of one mile and a half per hour, about twenty horses are employed under the most favorable circumstances. The *Victoria* towed it with about one-fourth only of her steam power at the rate of two miles and a quarter per hour. The ease with which she did this justified the opinion of several spectators, qualified to judge, that double this amount of tonnage might have been mastered by her with very little or no diminution of her speed. The wave produced by motion of the large vessels at the rate they were towed was of the ordinary size and character; that of the rapid boats, though large, was by no means so formidable as to create any fear that it would be any obstacle to the adoption of this mode of conveyance. In one of the latter experiments, four passenger boats were towed in a line, and the volume of the waves was evidently broken up into numberless smaller waves, spreading over the whole surface of the canal, and resembling a great ripple. The reverse of this occurred when two passenger boats were lashed together abreast as a twin boat; the wave then extended in a fine regular glassy swell from the boats to the shores. These effects point out the fact, that the form, magnitude, position, &c. of the wave are all susceptible of modification. As little is to be apprehended from curves, of whatever character. In the railway upon which the engine travelled there was a curve of double flexure, the radius of part of which was less than a third of a mile. No sensible retardation in her speed was produced by it, nor was any disposition observed, even in the most rapid transits, to run off the rails. To prevent the latter effect occurring from the resistance of the vessels towed, the outer rail was laid a little lower in level than the inner one, so as to give the engine a slight tendency to descend towards the outward rails. This also prevents, in a certain degree, the overturning of the engine by a strong pull. During the whole of the several series of experiments, not a single fact occurred to check the expectation that this union of the railway and the canal will, wherever practicable, take the precedence of every other, in point of convenience, safety, rapidity, and economy. Glasgow Chronicle.

We hope the New-York and Erie Railroad Co. will investigate this subject fairly, before deciding upon a route distant from the canal. Ed.

The "Archimedes" Steamer.—On Monday morning the three-masted steam-schooner the *Archimedes*, fitted up anew for the purpose of demonstrating the advantages of the Archimedes screw as a propeller,

proceeded down the river from London Bridge, on an experimental trip. The weather was most favorable, and a great number of amateurs, scientific and practical, availed themselves of the liberal invitation of the proprietors to witness the progress, nay, we may now confidently say, the success of the invention. The vessel started at a quarter past eleven, amidst the huzzas of the watermen, overjoyed to witness the advent of a steamer that raised no waves for their annoyance, and, indeed, scarcely left more disturbance in her wake than a sailing vessel. At Purfleet the speed of the vessel was accurately tried while passing the "measured mile" marked out by order of the Admiralty on the southern coast. Against wind and tide the *Archimedes* performed the mile in nine minutes five seconds. Turned round (which was done with the greatest facility, and in a very small circle,) and steaming up the river, with wind and tide, the same mile was performed in four minutes and a half. A third experiment down the river, against wind and tide, required nine minutes and fifty-two seconds. The engine was during these trials making between 22 and 23 strokes per minute, being $5\frac{1}{2}$ revolutions of the propelling screw, working in the "dead wood" of the vessel, immediately in front of the stern-post. The log, thrown at the turn of the tide, indicated a rate of nine knots. The most unqualified satisfaction was expressed by all on board at this performance, considering that the *Archimedes* has been fitted up as a sea-going vessel, drawing $10\frac{1}{2}$ feet, and not intended to exhibit in competition with sharp and shallow river craft. Even on this experimental trip the rigging was decidedly an obstacle when the wind was ahead, for no sails were set, though the vessel is fully calculated to proceed with them alone, if needful. The engines were much admired, and Massie's pumps which (strange yet true) cannot be choked! excited considerable attention, both by the quantity of water they could elevate, and the ease with which they could be worked. Still further improvements are in progress, by one of which (in the shape of the stem itself) Mr. Smith, the inventor, expects to be able to realize two additional miles per hour.

Bristol Mercury, Oct. 10.

It will be seen that the average speed, as above, is a mile in 6 minutes, $47\frac{1}{2}$ seconds, or $8\frac{17}{60}$ miles per hour. A similar boat is now in operation on the Delaware. ED.

The Archimedes Steamer.—Another experimental trip was made by this vessel on Wednesday, in presence of a number of distinguished naval officers and engineers. On starting from London Bridge, which was crowded with spectators, the Pool was much encumbered with vessels, in navigating through which, at considerable speed, the facility of steering was well demonstrated, and the absence of the paddle boxes was evidently of much advantage, as, in spite of the usual bustle, no accident occurred. On getting clear of the Pool, the engines made 22 revolutions per minute, and the speed of the vessel by the log was $7\frac{1}{2}$ knots, which, at Woolwich, was increased to $9\frac{1}{2}$ knots, with the tide and the wind on the starboard quarter. This speed was maintained to Greenhithe, when it was determined to try the vessel under canvass as well as steam. All the sails were set, and after proceeding

to Gravesend, where the British Queen was met, steaming up in all her majesty, the Archimedes turned and started for London, having the tide and wind in her favor. The distance from Gravesend to Blackwall was accomplished in two hours, which would give a speed of nearly thirteen miles an hour. Among the numerous visitors on board were noticed Sir Edward Parry, Sir William Symonds, Col. Acklom; Captains Basil Hall, Austin, and Smith, R. N.; Messrs. D'Este, P. Ewart, C. E., Miller, C. E., and Manby, C. E., all of whom appeared to pay minute attention to the action of the machinery. Bristol Mercury.

Power of Steam.—A pint of water evaporated by two ounces of coals, swells into 216 gallons of steam, with a mechanical force sufficient to raise 37 tons a foot high; and, by allowing it to expand, by virtue of its elasticity, a further mechanical force may be obtained at least equal in amount to the former. The circumstances under which the steam-engine is worked on a railway are not favorable to the economy of fuel: nevertheless, a pound of coke, burnt in a locomotive engine, will exert a mechanical force sufficient to draw two tons weight a distance of one mile in two minutes. Four horses, working in a stage coach, on a common road, are necessary to draw the same weight, the same distance, in six minutes. A train of coaches, weighing about eighty tons, and transporting 240 passengers, with their luggage, has been taken from Liverpool to Birmingham and back, the trip each way taking about four hours and a quarter, stoppages included. This double journey of 190 miles is effected by the combustion of a quarter of a ton of coke, the value of which is six shillings. To carry the same number of passengers, daily, between the same places, by stage coaches, on a common road, would require twenty coaches, and an establishment of *three thousand eight hundred horses*, with which the journey in each direction would be performed in about twelve hours, stoppages included. Lardner on the Steam Engine

Hail, wonder-working Steam!—Thanks to the improvement of navigation and the roads, London is now within twenty-one hours of Dublin; Ireland is nearer the English parliament than Scotland or Wales. How strange! England is now nearer to the United States of America, though they are three thousand miles distant, than she was to Ireland half a century ago, though Ireland is separated from her only by a narrow strait. These wondrous creations of human science, which are destined to change the social relations, not only of men but of nations, will exercise their first influence on Ireland, for the route between London and Dublin is the first great distance by land and sea which has been greatly diminished by steam.

De Beaumont's "Ireland," edited by Dr. Tay or.

The Steam Engine, &c. familiarly explained.—London: Taylor and Walton.—Dr. Lardner has just issued the *seventh* edition of the above work, which treats of the steam engine, steam navigation, and railways, and which is intended as an "easy and useful introduction to steam engineering, for all those who are interested in the arts and manufactures." The progress which this wonderful invention has made since the first machine contrived by Hiero of Alexandria, 120

years before the Christian era, "which was moved by the mechanical force of the vapor of water," is distinctly traced to the period when the memorable discoveries of James Watt gave usefulness and national importance to the invention. It would be easy to enumerate the benefits which have accrued from the practical effects of steam; these will be familiar to every reader of our columns; we therefore only observe, that civilization has been advanced by its power; comfort has been promoted by its means; liberty has been strengthened by its range; and the transit of men and merchandize over land and across seas, has been increased in a ratio which defies all calculation. The work will be illustrated and explained by wood engravings.

Novel Steam Apparatus.—There is in the Oxford Union workhouse a steam apparatus by means of which the whole of the clothing and other articles used in it are washed, dried, and ironed, in an incredibly short space of time. We have lately been afforded an opportunity of witnessing this useful piece of mechanism in operation, on which occasion no less than 1235 articles of wearing apparel, bed clothing, &c. were washed, dried and ironed, in two days, with the assistance of only eight women, and two girls from the school. It is the invention of James Wapshare, Esq., of Bath, for which we understand he has obtained a patent, and was some time since erected in one of the wings of the building solely devoted to the purposes of a laundry, at the expense of the chairman of the Board, the Rev. N. Dodson. The apparatus consists of a small steam boiler, with two pipes for the conveyance of steam. By the one pipe the steam is conducted to the coppers used for boiling the clothes, and supplying the washers with hot water; by the other the steam is carried to a closet in which the linen is to be dried. The exterior of this closet is a wooden frame covered with zinc; within, it is fitted up with pipes, increasing in number according to the extent of drying power required. These pipes are arranged horizontally one above another, resembling a turn-pike gate; excepting that the rails are connected at one end only by a bend or turn, thus forming a continued duct for the steam. The steam is admitted at the upper pipe, and passes its condensed water at the lowest. On either side of this tier of pipes is a moveable clothes-horse, which is drawn out to be hung with clothes. Upon the construction of these horses the operation of drying in a great measure depends. They are made close at the top of the box, so that no heat may escape over them, and the clothes are so disposed on them as to form an entire sheet, completely enclosing the pipes, and preventing any escape of the heat radiating from the pipes, except by passing through the clothes to be dried. This disposition of the clothes is easily accomplished, but difficult of description. On the outside of the horses, or on that side which is not next the pipes, a valve or opening is made on the top of the box, and a current of air being admitted at the bottom, the steam from the clothes is carried off as fast as it is generated. One set of these pipes, with two horses, would be sufficient for any moderate family. In an establishment so extensive as an Union house more is required. In the closet erected are three ranges of pipes, and consequently six horses or

two to each range, having an air space, with its valve between each set of horses. Attached to the flue that surrounds the boiler is a small oven for heating the irons, so that the whole operation of the laundry, as far as heat is required, is simultaneously effected by one fire.

Oxford Herald.

Antiquity of Railways and Gas.—Railways were used in Northumberland in 1633, and Lord Keeper North mentions them in 1671 in his journey to this country. A Mr. Spedding, coal agent to Lord Lonsdale, at Whitehaven, in 1765, had the gas from his Lordship's coal pits conveyed by pipes into his office for the purpose of lighting it; and proposed to the magistrates of Whitehaven to convey the gas by pipes through the streets to light the town, which they refused. Carlisle Journal.

Railway Speed.—The Railway Times states that, a few days back, an experiment was made on the Western Railway, in which the twenty eight miles was gone over at the rate of more than a hundred miles an hour.

M. Pambour has stated to the Academy of Sciences, that on the 3d of August last he had travelled with the Evening Star engine, taking with it only the tender and eight persons, at the rate of fifty-four and a half miles per hour, on the Great Western Railway; and that had the feeding pump been larger, he thought they might have gone still faster.

Mr. Brunel, it is reported, has succeeded in obtaining a railway speed equal to two hundred miles an hour!

A Locomotive Excavator.—M. Gervais, a manufacturer at Caen, has presented to the Academy of Sciences a model of a locomotive excavator. The inventor intends that the machine should be employed in the excavation of canals and formation of railways.

The railroad from Amsterdam to Haarlem was opened lately. It is the first road of the kind in Holland.

The first Railroad in Italy.—The railroad from Naples to Castellamare was opened on the 3d inst. by the King in person. Three Marquises were set up at Villa Carrione, near the station at Portici, at which the King, on alighting with the Royal family, was received by the Minister of the Interior, a commissioner appointed by the French shareholders of the company, a Neapolitan commissioner, and the chief engineer. The French commissioner, M. Dubois, made a suitable address to his Majesty, to which the King replied in the most gracious manner, taking occasion to say, "I experience great satisfaction at seeing Frenchmen uniting their interests with Neapolitans in this fine undertaking. The railroad will assuredly be of great benefit to commerce and industry. I have given my entire protection to this the first

essay of the kind in Italy ; and being convinced of its utility to my people, I contemplate on the termination of your works as far as Nocera and Castella, a continuance of the communication by Avellino to the Adriatic. It will give me pleasure to enter into an association with the French." At a signal from the Fort of Grenatello a train started from Naples for Portici, the waggons being filled with soldiers and sailors, waving flags, and bands of music playing national and popular airs. The religious part of the ceremony followed. Monseigneur Giusti, in his pontifical robes, recited appropriate prayers, and pronounced his benediction on the undertaking. Another train, with the Royal and Court carriages, came up, and the King and Royal family, accompanied by the Minister of the Interior, the Commissioners, and other authorities, proceeded in them to Portici, where his Majesty and the Royal family with the Minister and Commissioners alighted, the rest of the party remaining in the carriages. Having minutely examined the locomotive engines and other parts of the establishment, his Majesty and the Court returned by the ordinary road to Naples. The railroad was in the afternoon given up to the public. The King has created M. Dubois, the French Commissioner, and M. Bayard, the chief engineer, Knights of the Order of Merit of Francis the First, a distinction the more honorable as there are only one hundred members of this order.

Railway Traveling.—The extraordinary developement of the inclination for railway traveling (observes the *Railway Times*) in proportion as this means of conveyance is extended through different parts of the country, may be inferred from the following summary of the passenger traffic on various lines of railway recently opened :

			Days.	Passengers.
Great Western, from July	1 to Dec. 31,	1838, ..	181....	220,018
" " " Jan.	1 to June 30,	1839, ..	181....	258,854
" " " July	1 to Aug. 25,	1839, ..	56....	132,918
London and Birmingham, Jan. 1 to June 30,	1839, ..	181....		267,527
Grand Junction receipts.....	1837.	1838.	1839.	
Week ending July 8, ...	£3324 ..	£6615 ..	£9,235	
" " " 15, ...	4910 ..	6602 ..	9,013	
" " " 22, ...	5452 ..	7119 ..	9,748	
" " " 29, ...	4673 ..	6617 ..	9,691	
" " Aug. 5, ...	4187 ..	7143 ..	10,019	
	£22,546	£34,096	£47,706	

Birmingham Railway.—The journey of 112½ miles is now performed in five hours, stoppages included.

London Paper.

Traveling Times.—The rate of traveling on the London and Birmingham and Grand Junction Railway lines has recently exhibited a very considerable acceleration. The London morning mail train to Liverpool and this town, completed its journey from station to station, we believe, in less than nine hours. From Birmingham to Stafford, twenty-nine miles, the ground was gone over in fifty-five minutes ; to

Warrington seventy-seven and three quarter miles, in two hours and forty-three minutes; and the journey from Birmingham to Manchester, ninety-seven and a quarter miles, was performed, notwithstanding a stoppage of ten minutes at Warrington, and a short stoppage also at Park Side, in three hours and forty-six minutes.

Manchester Guardian.

Tendency of Railways to create Traffic.—The Dundee and Newtyle Railway is about ten and a half miles in length; and previous to its opening, in 1832, the number of passengers accustomed to traverse the same route was estimated at 4,000 per annum. For two or three years the line was worked by horse power, but even then the number of passengers averaged 30,000 per annum. When locomotive engines were brought into use, that number was greatly increased, till now, the *monthly* average is very nearly five thousand; being at the rate of sixty thousand passengers per annum, or a *fifteen fold* increase on the number previous to the construction of the railway.

Railway Times.

The tendency of railways to create traffic is strongly shown in the case of some of the Northern lines. For example, the Arbroath and Forfar Company are carrying from two hundred to three hundred passengers a day, parallel to a line of road which never did, and never could support a single horse coach.

Misconception on Railways.—It is a singular fact in the early history of locomotive carriages, that their projectors assumed the existence of a difficulty which is known to be wholly imaginary; and, like the ancient Romans in the conveyance of water, without a knowledge that it would rise to its level, they resorted to sundry laborious contrivances for overcoming an obstacle that had no existence, and which nature herself, had she been asked, would have accomplished for them. They assumed that the adhesion of the smooth wheels of the carriage upon the equally smooth iron rail must necessarily be so slight that, if it should be attempted to drag any considerable weight, the wheels might indeed be driven round, but that the carriages would fail to advance because of the continued slipping of the wheels. The remedies devised for this fancied counteraction were various. One was conceived so valuable that a patent was taken out for it in 1811, by Mr. Blenkinsop. It consisted, as the writer well remembers, of a rack placed on the outer side of the rail, into which a tooth wheel worked, and thus secured the progressive motion of the carriage. It was, however, wholly useless—it was an impediment; the simple adhesion of the wheels with the surface of the rails upon which they are moved being by an immutable law amply sufficient to secure the advance, not only of a heavy carriage, but of an enormous load dragged after it.

Wade's British India.

Race between a Deer and a Steam Engine.—While the cars were coming down on Wednesday, a fine buck made his appearance on the track, and had a trial of speed with the locomotive. He kept the track for two miles, when he was finally run off, or he would have

been run over. The sight must have been deeply exciting and highly interesting; as the line of road is perfectly straight, every inch of the contest was witnessed by the passengers.

Washington N. C. Gazette.

The Simplon road surpassed.—M. Volta, who has obtained the privilege of making a railway from Milan to Como, is now negotiating with the Swiss Cantons of the Grisons and St. Gall, for making a tunnel through the Grisons Alps, and a railway through the two Cantons, to join that of Como. On condition of receiving an exclusive privilege of enjoyment for one hundred years, he engages to complete the work in thirty years from the commencement.

The south eastern railway. Shakspeare Tunnel.—This tunnel, with its lofty gothic arches of thirty feet high, begins to shadow forth its ultimate effect. The passage through, our readers are aware, has long been completed; but as this excavation is principally that stratum of the chalk called by Philips "the chalk of abundant organic remains," which possesses the property of being at the same time of great hardness, and in small detached masses, wanting cohesion, the progress has not hitherto been so rapid; and in many places, more brick arching has been used than was at first contemplated. The work is beautiful in its execution, and of great durability. Passing through this tunnel, we come upon a vast platform, which forms the termination of Shakspeare tunnel, and the commencement of that of Abbott's cliff. This latter is longer than the former, but as the chalk is much freer in its working, and more cohesive, some alterations will be permitted in the size and height of its tunnel, so as to admit of its being more expeditiously worked. The shafts, driftways, and galleries of this tunnel, are complete. Beyond this, one comes upon the wall, now in a state of forwardness; this wall is formed from a concrete of the grey chalk, or Halling lime, and the beach of the seashore. Its base is about thirty feet in thickness, and decreases upwards; and the top of the wall will be about twenty feet above high water mark; that part of it approaching to completion is very hard, and appears of great durability. From this wall, a gallery leads to Little Switzerland, or the Warren; and through the Warren the railway is conducted to Martello Tower No. 1. The earth cuttings in this part are proceeding very rapidly, there being nearly four hundred men employed in a short space. At Tower No. 1, the road tunnels and continues to Beachborough Hill in a straight line, passing over the junction of the Dover and Canterbury roads in its progress; the bridge for this viaduct is commenced. Of the farther continuation of the line we know but little more than that we hear every thing is going on successfully. The present pressure upon the money market has, doubtless, much influenced the price of these securities, in common with others; but it must be some consolation to distant shareholders to learn that, though the value in the market has receded, the expectations and confidence of the local proprietors have risen more than cent. per cent. during the last few months, convinced, as they appear to be, that the natural difficulties which have opposed themselves hitherto, are disappearing rapidly before the well directed energy and perseverance of the conductors.

Dover Chronicle.

COL. PASLEY'S OPERATIONS AGAINST THE WRECK OF THE ROYAL GEORGE, AT SPITHEAD.

The great cylinder containing about one ton of gunpowder, which was let down on the 23d October, and which did not explode when the action of the galvanic battery was applied to its priming, had become, somehow, entangled amongst the wreck, and could not be extricated. The hawser which was attached to it being broken, and the downhaul rope having got foul of the ship's timbers, it was necessary to investigate matters by means of the "helmet divers," and as these men could work only at slack water, a period which at spring tides is extremely short, many successive days were employed in this difficult research. At length on the morning of the 30th the cylinder was got at, and a hook rope being attached to one of its rings, the monstrous charge was drawn to the surface, when the whole of the powder was found to be saturated, with water. The cause of this accident has not yet been ascertained, nor can it be till the cylinder is completely dismantled and inspected by Col. Pasley, whose official duties have called him away to Chatham; and we shall, therefore, content ourselves at present with mentioning the fact. We may observe, however, that in every great operation of this kind, where almost all the circumstances are either new in themselves, or new in their application, failures of this sort are always to be expected; and that were an officer, from any fear of not succeeding at once, to hesitate in trying bold and energetic experiments, the service entrusted to him might remain for ever unperformed. It is the province of genius to conceive, and of talents and experience to execute, measures of 'pith and moment' from which minor minds might shrink. But in the execution of their task, as they have not the presumption to suppose themselves infallible, so they readily avail themselves of the fresh instruction which every failure, if rightly observed, is sure to impart. And we have no doubt that Col. Pasley with his wonted sagacity and perseverance, will derive from the accident alluded to, more expeditious, and even more economical methods of accomplishing the purpose entrusted to him by the Government, than if all had gone smoothly from the first. And here it may not be amiss to state what is the purpose of these operations. The *Royal George* was overset and went to the bottom on the 29th August, 1782, and she has been allowed to lie there during no less a period than 57 years—much to the disgrace, we must say, of the engineering science of this country—for the place where this enormous wreck has so long lain, is the most central, and in other respects, one of the best parts of Spithead. During the war, when large fleets of line-of-battle ships and great convoys of traders, filled up the anchorage, the blank space which encircled the buoy of the *Royal George*, and which it was dangerous to approach without risk of loss both of cables and anchors—was often greatly lamented. Things are changed now, and should the *Blenheim* or *Pique*—which God forbid!—go down to day at Spithead, we have no doubt whatever that in less than a fortnight Mr. Sadler, the able Master Attendant of the Dock yard, would raise her, and place her in safety in the basin.

In the case of the *Royal George* this is impossible, and the plan seems to be to blow her to pieces by a succession of great and small charges, and then raise the fragments by means of ropes attached to them by help of the diving bell. Many technical difficulties occur in this process, in placing and fixing the vessels properly, in sounding over the wreck, in warping and securing the lighters containing the charges, and finally in adjusting the boats and ladders, by which the helmet divers descend, or from which the diving bell is lowered. In arranging and conducting the details of these complicated manipulations, Col. Pasley, we are glad to see, has the advantage of Mr. Sadler's experience; and we are sure that his abilities, his cheerfulness, and his habits of resource, cannot fail to prove of the greatest use. The engineering details, on the other hand, are under the immediate management of captain Williams, of the Royal Engineers, and of Mr. Symonds, also of that corps, son of the Surveyor of the Navy. These officers, with a party of sappers and miners, live on board the *Success*, a frigate in ordinary, which, with no small consideration and foresight, had been moved out to Spithead, for the accommodation of the various parties employed on this service. Boats, officers, and seamen are also furnished by H. M. S. *Pique*, Captain Boxer, to assist in the many laborious processes connected with these operations.

On Thursday last, the 29th August, being the anniversary of the day on which

" Brave Kempenfelt went down
With twice four hundred men,"

Col. Pasley made an effort not to let the old ship be any longer in peace, and on this occasion he succeeded so completely that, if ever we had held the slightest doubt of his being able to accomplish the object in view, our apprehensions on this score must have been removed. Five successive charges were sunk and exploded on the wreck, and, so far as can be ascertained, with the most destructive effect. These charges, however, were comparatively small, the largest containing only 180 pounds of powder, the other four being of 45 pounds each. They were all fired by means of Bickford's fuses, an ingenious device, by which a match is made to burn for two minutes under the water, before the fire reaches the charge, which then explodes.

The method of setting off these charges may interest our readers. A weight, say a pig of ballast, or for economy, a heavy bag of sand or shingle, is lowered till it reaches the wreck, by means of a small slip rope, rove through an iron ring, both ends of the rope being kept on board the boat. To one end of the rope the vessel containing the charge is then made fast, and the other being well manned, the match is lighted, the vessel plunged into the water, and the rope briskly hauled in, so that long before the fuse is burned out, the charge is close down to the ring, and the boat removed at a safe distance.

The first, or largest explosion, on the 29th, produced a double shock sufficient to shake one of the largest of the dock-yard lighters or lumps from end to end, and to produce a sensation to those who were on board her, resembling a smart shock of electricity or galvanism. The interval between the shocks was very short, say the tenth of a second. The sound was sharper and louder than we had

expected, of a quick, angry, character. The effect on most persons was remarkable, but not the same on all. Several ladies who were present felt severely shaken in the back, many imagined they were thrown up an inch or two off the deck, and one person had a headache instantly after feeling the shock.

The water over the explosions was not in the smallest degree affected so far as could be observed, for four or five seconds, when a boiling motion became apparent, and an evident rise in the water over a circular area of ten or twelve yards, accompanied by the most violent ebullition. Some go so far as to say the water rose four or five feet over the great explosion; we dare not say that it much exceeded a foot, or a foot and a half. Be this as it may, no smoke was seen, and at first only a prodigious evolution of air or gas, and a violent commotion on the water. In the course of a few seconds a cloud of mud, of a dark blue color, rose to the surface, accompanied by a disagreeable smell, caused either by the inflamed gunpowder or by the fœtid mud collected over the wreck. Several large fish were killed by the first explosion, but none by any of the others; at least none rose to the surface.

What change Col. Pasley may make in his operations when he comes to examine the unexploded cylinder, now recovered from the wreck, we cannot pretend even to guess. That he will not be baffled, is all we are certain of; and as he has given out that an explosion on the great scale will be attempted on Tuesday next, the 3d, we are nearly as certain, that he will not disappoint the public. The time will be either at 11 A. M. or 5 P. M. but probably the former, as that suits best for the neap tides; and it is said the Lords of the Admiralty are to be present on the occasion.

Twelve tin packets of preserved French beans, in a wooden box have been brought up from the Royal George, stamped "Conserve Artichena de Catron, Marseilles." Neither vinegar nor pickle had been used; they had been boiled and placed in air tight vessels, and were as fresh and fit for use as when first enclosed. They have been 57 years under water.

Kentish Observer.

A new Conservative Power. The conservative power of mud has also been most curiously exemplified in the case of vegetable fibre, by a portion of a cable lately brought up from the wreck of the Royal George. A piece of a cable twenty-three inches in circumference, and about eight feet long, was recovered, and being unlaid and the yarns taken out, they were found to be so good that a short piece of one of them bore a weight of 193lb. and broke only with a weight of 195lb. The following experiment was then tried: a piece of rope, measuring two inches and a half in circumference, was made out of the yarns from one of the strands taken from the junk of the Royal George, and marked No. 1; another, also of two inches and a half, and twenty thread yarn, spun and tarred in 1838, was made No. 2; and a third of the same dimensions and number of yarns, spun and tarred according to the old method, in 1830, No. 3. These three ropes were then exposed to the usual test of strength by weights in the dock yard, when, to the great astonishment of every one, the following were the results:

No. 1. Made from old junk saved from the Royal George, after being fifty-seven years under the mud, broke with a weight of.....	cwt.	q.	lb.
No. 2. Spun and tarred in 1838.....	21	3	7
No. 3. Spun and tarred in 1830.....	23	1	7
	20	1	7

We have great satisfaction in communicating that the proceedings of this distinguished and persevering officer are daily becoming more important in proportion as his experience affords to his skill and ingenuity fresh means of overcoming the difficulties in his way. On Monday last a huge mass of the larboard counter was got up, and about twenty-four feet of the foremast, the lower part of which, including the step, was quite perfect. On Tuesday, the 15th, another of Col. Pasley's immense charges, consisting of 2400 pounds of powder, was fired by the voltaic battery. The effect was to blow the fore part of the ship so completely in, that on the next day one side of the bows, including two of the hawse-holes, was fished up, and in the afternoon of the same day the other side of the bow, with two other hawse-holes, was drawn to the surface. Numerous beams and a huge knee, called the breast hook, were also got up. The figure head, as may be supposed, has been anxiously looked for, but in vain. Our readers are already aware from other sources that six iron thirty-two pounders and five brass guns have been recovered, together with much copper sheathing, the value of which already nearly equals the expense of the operation. The real value of the operation, however, consists in the important advantage it will confer on the principal naval anchorage; and Col. Pasley, we think deserves the thanks of naval men, as well as of the country, for his bold conception and able execution of this formidable enterprise. Our correspondent at Portsmouth mentions that the mass of water forced up by the last great explosion was not more than fifteen feet, or about one half of the height to which it was driven on the first occasion.

Times.

The Royal George.—On the 30th October, a gentleman of the name of Vansittart descended to the spot where the Royal George is now lying. He describes the wreck to be enveloped in entire darkness, and to be completely imbedded in mud. This account fully corroborates the statements of the divers; and it is to be hoped that some means may be suggested by which light may be diffused below. It is true that Mr. Vansittart descended when the waves on the surface of the sea were undulating to a height of 30 or 40 feet, and it could not, therefore, be expected that he would see much under such circumstances. But the divers assert, that even on the brightest days of summer, when the sea is perfectly calm, they can scarcely see an inch before them. Lanterns have been tried but to no purpose. A vast expense would be saved, not only as respects the Royal George, but also with reference in future wrecks, if some means could be devised for introducing the light required.

The Royal George.—Col. Pasley has concluded his operations against the Royal George for this season. It is intended to recom-

mence operations about May next. There have been consumed during these experiments 12,940lbs. of powder. Above 100 tons of the wreck have been recovered and placed in the dock yard at Portsmouth, with five brass and six iron guns. It may not, perhaps, be generally known that the total expense incurred has been more than defrayed by the value of the articles recovered.

Kentish Times,

NATURAL HISTORY.

Antiquity of the Pyramids.—M. Caviglia gave me an account, when I was in Cairo, of a singular discovery he had made, in the vicinity of the Pyramids, of a number of apartments and passages communicating with each other, and of his having seen, at a distance of many miles in the desert, the foundations of decayed pyramids, whose granite blocks were dissolved to dust: whence he argues, that if those now standing, composed chiefly of sand-stones, be four or five thousand years old, the antiquity of those others must be four times as great. Prince Puckler Muskau.

Climate of South Australia.—South Australia is situate on the southern coast of the great continental island of New Holland, and lies between the 25th and 39th degrees of south lat. and 132d and the 141st degrees of east long. It contains an area of about 300,000 square miles, or 192,000,000 acres, and it possesses, in a greater degree than any other portion of Australia, the important advantage of water communication; being indented by the great inland seas, denominated Spencer's and St. Vincent's Gulfs, and being traversed by the only considerable river, capable of inland navigation, hitherto discovered in New Holland. The province presents a sea coast of 1,300 miles. Port Adelaide, on which the capital is situated, is a perfectly secure harbor for vessels not exceeding 500 tons. Nepean Bay, in Kangaroo Island, is a more spacious harbor, capable of receiving shipping of the largest class; and Port Lincoln, on the western promontory, forming Spencer's Gulf, is one of the finest harbors in the world. Lake Alexandria is an extensive sheet of fresh water, forty miles in length, and thirty-five miles in breadth. The Murray and its tributaries, when cleared of the obstructions occasioned by the fallen timber, will be navigable by boats for upwards of 1,000 miles. The climate of South Australia is one of the most salubrious in the world. Fevers, and agues, so prevalent in the United States, and in the British settlements of North America, are here unknown. Exploring parties sleep upon the ground, in the open air, without hazard to their health. The weather is much warmer than in England, and the changes in the thermometer are sometimes sudden and considerable; but, from the prevalence of the sea breezes, and from the extensive purity of the atmosphere, the high temperature, as shown by the thermometer, is not felt to be more oppressive than summer heat in this country. As compared with England, the climate is very dry; but, as compared with the eastern coast of New Holland, it may be said to be moist; for, open to the southern winds, which are the prevalent winds in that quarter of the world, South Australia is not ex-

posed to the long-continued droughts which occasionally visit the colony of New South Wales. During the last year, the drought in New South Wales was so great that, in many places, the flocks were dying for want of water; while this severe visitation did not extend to the moister climate of South Australia.

Pamphlet of Col. Torrens.

Pigeons.—We are not aware whether pigeon fanciers have ascertained the average duration of life of this bird, when old age is permitted to terminate its existence; but however this may be, we are in a situation to enlighten the curious on this matter. James Garside of Birkenshaw, has now in his possession a male bird of this species, which he purchased sixteen years ago, and which was at the time upwards of two years of age, so that the bird is now in its nineteenth year. About two years ago it began to manifest signs of physical decay; the female with which it was mated ceased to lay any eggs, and latterly its sight has failed to such a degree that it was with difficulty it could steer its aerial flights, and its owner has very considerably placed it in a large wicker cage.

Inverness Courier.

The Bezoar.—Lately, in the parish of Tarbolton, a concretion was taken from the stomach of a sheep after it was killed. It is nearly the size of the hand, spherical in shape, and in color and substance like corn dust. It is supposed that wool, conveyed with the milk into the stomach of the animal, when young, forms the nucleus. Such concretions were at one time famous as an antidote to similar productions in the human system, and were designated, by way of eminence, Bezoars. But the increasing influx of knowledge, is fast putting to flight the numerous family of charms, and mankind have long since refused to test the powers of the Bezoar.—*Correspondent.* The Bezoar, or Bezoard, no doubt belonged to the “family of charms,” and was not only considered efficacious, as our correspondent observes, in dissolving similar concretions in the human system, but believed to possess high alexipharmic qualities, or, in other words, the power of counteracting poison. The light of science, however, refuses to attribute to the Bezoar other virtues than those “common to the saline particles of which it is composed, and which can be procured to greater advantage from other sources.” The term Bezoar, is supposed to be from the Persian *pazahar*, an antidote or destroyer of poison. The stones were chiefly obtained from Asia and South America—the gazelle and goat in the former, and the pard and chamois in the latter, yielding them in greatest abundance. They were sometimes, though less frequently, found in the wild-boar, horse, rhinoceros, elephant, and other animals. The Persian stone was esteemed of the highest value, and called, *par excellence*, *bezoar orientale*. In size it was seldom larger than a kidney bean, of a round or rather oblong form, smooth in surface, and of a dark green color. The common Bezoar is often found in the stomach of goats. The one described by our correspondent is the largest we have heard of.

Ayr Observer.

Equivocal Generation.—*Zoological Society.*—At the ordinary scientific meeting, on Tuesday evening, F. Wishaw, Esq. in the chair, the

first communication read was a letter from Mr. Mackay, of the British consulate at Maracaibo, on a plant called Projojoy in the country from which it is derived, and which attains the condition of a plant from the strange metamorphose of an insect. In the insect which was described some of the legs have already changed into roots, and in this state it was presented to the contributor. It was announced that a similar insect had lately been discovered in North Carolina. When the creature assumes the form of an insect or animal, it is about an inch in length, and much resembles a wasp in appearance. When the insect has attained its full length, it disappears under the surface of the ground and dies, soon after which, the two fore-legs begin to sprout and vegetate, the shoots extending upwards, and the plants in a short time reaching a height of six inches. The branches and the leaves are like trefoil, and at the extremities of the former there are buds which contain neither leaves nor flowers, but an insect, which as it grows falls to the ground, or remains on its parent plant, feeding on the leaves till the plant is exhausted, when the insect returns to the earth, and the plant roots forth again.

Earthquakes.—The latest arrivals from the Mediterranean state that Vesuvius is inwardly convulsed, and thick clouds of smoke cover the mountain top, the vapor of which is so very prejudicial to the vines in the immediate neighborhood, that the Government has remitted the taxes of the growers. It is a remarkable fact that the eruptions of Vesuvius have, almost in every case, been preceded by alarming indications of the volcanic action in Perthshire. About a month ago, it will be recollected, that some smart shocks were felt at Crieff and Comrie. It now turns out that, almost immediately afterwards, Vesuvius became convulsed. It thus appears that there must be a chain of strata, of uniform sympathy, stretching from the Grampian and Ochill Hills to Italy. There is nothing in the history of Scotland to show that earthquakes were peculiar to Perthshire, previous to the great earthquake at Lisbon; but, since that time, they have been more or less common; and on the assumption that a chain of electrical strata does exist in this direction, the conclusion might be drawn that, 'the foundations of the earth,' so to speak, were then 'rent;' and thus, according to Daubene's hypothesis, 'water and atmospheric air' would thereafter find comparatively easy access 'through the channels in the rocks,' and reaching the heat which is believed to 'exist below a given point of the earth's surface,' produce the volcanic action. From the borings which have been made in Perthshire, in search of coal, the strata have been proved to be highly charged with electricity, more especially in the valley of Strathearn; and it has also been demonstrated that the heat there is not far from the earth's surface. Loch Earne, too, never freezes—a phenomenon exclusively applicable to that lake, as compared with others of equal dimensions in Scotland. Taking all these circumstances into account, we think they open up a very interesting and inviting field for the further investigation of physical science in connection with volcanic phenomena, and we hope the attention of scientific gentlemen will be early directed to the subject.

Spots on the Sun.—The *Gazette du Midi* gives an account of a discovery by Count Decuppis, the Italian astronomer. He is said to have succeeded in manufacturing glasses which enable the observer to look at the sun without having his observations at all affected by its rays. By means of those glasses the sun appears of a pure whiteness, and the surrounding firmament is equally distinct. M. Decuppis is stated to have observed on the 3d instant an unusual number of spots on the sun's disc, and having made an addition to his apparatus, he perceived at a quarter before nine, on that day, a small black spot, entirely free from penumbra, and of perfectly spherical form, which had advanced upon the disc, describing an arc of about seven minutes. Reiterated observations convinced him that it had, in the mean time, advanced towards the sun's limb, to the extent of two minutes and thirty seconds. At three minutes after nine, when M. Decuppis attempted to make a new observation, the spot had disappeared. The perfectly round figure of the spot, its blackness, the smallness of its diameter, its motion, and the absence of penumbra, appeared to the observer to be so many proofs that it was a small planet, hitherto undiscovered, which was passing over the sun's disc.

Galignani's Messenger.

The Owl at Sea.—The ship *Margaret*, which arrived at this port on Friday last, from Quebec, has brought home a prisoner of rather extraordinary description. This is a fine owl, which was captured at sea, not less than 500 miles from any land. Whither the solitary bird was voyaging is not known.

Liverpool Mercury.

Colored Salt.—There are hills of colored salt near Darabgird, white, black, green, yellow, and red. This salt the people fashion into trays, and whatever else they wish, and send them into distant regions. In all other countries salt is produced from the bosom of the earth, or from the concretion of water, but here it appears in the form of entire mountains. The plain, which is twelve miles from Darab, appears glittering with particles of salt, which was more abundant in each handful I gathered from our path than sand or earth.

Sir W. Ouseley's Travels in Persia.

Geographical Discovery.—Mr. Schomburgk, the enterprising traveler in British Guiana, where he has been employed for the last four years as an agent of the Royal Geographical Society, and at the expense of their funds, aided by a grant from government, has just returned to England, after an absence of nearly twelve years. Following in the steps of Dr. Hancock, Mr. Hillhouse, and others, he twice ascended the river Essequibo, which he explored to its sources, about 40 miles north of the equator, and then examined the Berbice and Corentyn rivers. During his last journey, in which he was absent for two years, in the interior, he crossed the boundary to Fort San Josquim, in the Brazils, and by a westerly course, traveled to Esmeralda, on the Orinoco, thereby connecting his labors with those of Baron Humboldt in 1800, and materially changing the position of the sources of that river, as laid down in all our maps. From thence he again ascended the Rio

Branco, to San Josquim, completing a circle of upwards of 2,000 miles, a great part of which was through a country previously unknown. Mr. Schomburgk's communications have often formed matters of interest at the meetings of the Geographical Society, and he has brought over with him to this country, a valuable herbarium, and a large collection of rare specimens of natural history, the produce of a country almost unknown to Europeans. He is also accompanied by three Indians of different tribes, from the interior; and has brought specimens of their arms, implements and utensils. Accounts have also been received from Mr. Gould, who has left Van Dieman's Land for Southern Australia, having already collected about 800 specimens of birds, and 70 quadrupeds, with many other objects of interest in natural history.

Discovery of a Canoe.—About two months ago, while some drainers were employed at Loughley Loch, in the parish of Tarbolton, they came upon a canoe, buried eight feet below the surface of the earth. This interesting naval relic, of ancient days, is about sixteen feet in length, and three in breadth, and is formed after the most approved Indian fashion. It is constructed of the hardy mountain oak, is perfect in all its parts, and in a state of comparatively good preservation.

Kilmarnock Journal.

Discovery of a Subterranean Chamber at Alton.—A number of laborers have lately been employed, by the Earl of Shrewsbury, in excavating part of the ruins of the ancient baronial castle, which forms the chief ornament of this picturesque village. Amongst other trifling curiosities they found some bullets, and a piece of ancient coin; but a few days since they discovered a subterraneous apartment and a flight of stone steps, which apparently form a descent to the bottom part of the stupendous and lofty rock on which the castle is built. The excavation has since been suspended by order of the earl, who intends to continue it to a still greater extent on his return to England next summer.

Staffordshire Examiner

The Barometer.—It is a singular fact, that since Thursday last the mercury has stood here, almost constantly, at the height of $30\frac{1}{2}$ inches, which is marked *set fair* on some Barometers; and yet we have had rain every day, and often in heavy showers. Is it possible that this phenomenon has any connexion with the earthquake?

Scotsman.

The late Earthquake.—The most remarkable effect of the shock in Edinburgh, and which was not at the moment observed, is the detaching of some blocks of freestone from a stratum which was laid bare by the formation of a castle road, on the south of the Esplanade, and which now lie across the footpath. Two of these blocks are of considerable size, and will weigh, at least, ten tons.

Caledonian Mercury.

Paper was first manufactured in England, by John Spilman, or Spielman, a German, in the reign of Elizabeth, who granted him the subordinate manor of Portbridge, or Byckmore, in Dartford, Kent, which had previously been an appendage to the priory. Here on the site of a wheat and a malt mill, he built a paper-mill for the making of writing paper; and in the thirty-first of Elizabeth, who knighted him, and to whom he was Chancellor, he obtained a license for the sole gathering, for ten years, of all rags, &c., necessary for the making of such paper. He died in 1607, at the age of fifty-five; his effigy, and that of his lady, are in the chancel on the north side of Dartford church.

Mirror.

☞ We have just received a valuable communication from the Hon. DANIEL WEBSTER, and sincerely regret that it has come too late for insertion in the present number. It will certainly appear in our next.

LIST OF PATENTS,

Granted for Scotland subsequent to 22d November, 1839.

To Alexander Borland, of Paisley, accountant, a machine for measuring water and other liquids, and regulating the quantity thereof. Sealed 26th October.

James Smith, of Deanston Works, Perthshire, cotton spinner, for certain improvements applicable to canal navigation. Sealed 26th October.

George Chapman, of Whitby, engineer, for certain improvements in steam engines. Sealed 26th October.

Samuel Wilkes, of Darlston, Staffordshire, iron founder, for improvements in boxes and pins, or screws for vices and presses. Sealed 28th October.

Thomas Nicholas Raper, of Blackfriars, London, for improvements in rendering fabrics and leather water-proof. Sealed 28th October.

Robert Edward Morrice, of King William street, London, (communicated by a foreigner residing abroad,) for improvements in the manufacture of boots and shoes, and covering for the legs. Sealed 26th October.

James Smith, of Deanston Works, Perthshire, cotton spinner, for a self-acting temple, applicable to looms for weaving fabrics, whether moved by hand or power. Sealed 1st November.

James Yates, of Effingham Works, Rotherham, iron founder, for certain improvements in the construction of cupola or blast furnaces for melting metals, which improvements are also applicable to furnaces or fire-places for other purposes. Sealed 1st November.

John Barnett Humphreys, of Southampton, civil engineer, for certain improvements in shipping generally, and in steam vessels, in particular, some of these improvements, being individually novel, and some the result of novel applications or combination of parts already known. Sealed 1st November.

John George Bodmer, of Manchester, civil engineer, for certain improvements in machinery or apparatus for cutting, planing, turning, drilling, and rolling metals, and other substances. Sealed 8th Nov.

William Newton, of the Office for Patents, Chancery-lane, London, civil engineer, for certain improvements in machinery or apparatus, for making or manufacturing screws. Sealed 11th November.

James Sutcliffe, of Henry street, Limerick, builder, for certain improvements in machinery or apparatus for raising and forcing water or other fluids, and increasing the power of water upon water wheels and other machinery. Sealed 11th November.

James Ulric Vaucher, of Mount-street, Grosvenor-square, for certain improvements in fire engines and other hydraulic machines and apparatus, for raising or propelling water and other fluids, some of which improvements are also applicable to steam engines. Sealed 11th November.

Moses Pool, of Lincoln's-inn, (communicated by a foreigner residing abroad,) for improvements in apparatus applicable to steam boilers, in order to render them more safe. Sealed 11th November.

James Craig, of Newbattle paper mills, county of Edinburgh, for an improvement or improvements in the machinery for the manufacturing of paper. Sealed 12th November.

Pierre Auguste Ducoté, of 70 Saint Martins Lane, London, for certain improvements in printing china, porcelain, earthenware, and other like wares, and for printing on paper, calicoes, silks, woollens, oil cloths, leather, and other fabrics, and for an improved material to be used in printing. Sealed 14th November.

John Dickenson, of Nash mill, county of Hertford, paper maker, for certain improvements in the manufacture of paper. Sealed 18th November.

George Hanson, of Huddersfield, plumber, &c. for certain improvements in the construction of cocks or taps for drawing off liquids. Sealed 19th November.

Frederick Clark, of Chelsea, for improvements in building ships, steam vessels, and boats, and also in the building of canal and river barges and lighters. Sealed 22d November.

Charles Andrew Caldwell, of Audley-square, London (communicated by a foreigner residing abroad,) for improvements in furnaces and apparatus for applying the heat of fuel.

William Wiseman, of George-yard, Lombard st. London, communicated by a foreigner residing abroad,) for improvements in the manufacture of alum.

New Patents sealed in England, 1839.

- To Stephen George Dordoy, of Blackman street, Borough, chemist, for certain improvements in the manufacture of gelatine, size, and glue. Sealed 31st October—6 months for enrolment.
- To David Greenwood of Liverpool, millwright, and William Pickering, of Liverpool, merchant, for improvements in engines for obtaining power. Sealed 2d November—six months for enrolment.
- To Samuel Morand, of Manchester, merchant, for improvements in machinery for stretching fabrics. Sealed 2d November—six months for enrolment.
- To Theobald Wahl, of George-yard, Lombard street, engineer, for improvements in boilers, applicable to locomotive and other engines. Sealed 2d November—6 months for enrolment.
- To Alexander Angus Croll, of Greenwich, manufacturing chemist, for improvements in the manufacture of gas, and in reconverting the salts used in purifying gas, and improvements in the manufacture of ammoniacal salts. Sealed 2d November—6 months enrolment.
- To John Cutten, of Margate, coal merchant, for improvements in garden pots. Sealed 2d November—6 months for enrolment.
- To William Hannis Taylor, of New-York, but now of Bridge street, Blackfriars, Esq. for improvements in obtaining power by means of electro-magnetism. Sealed 2d November—6 months for enrolment.
- To Frederic Augustus Glover, of Charlton, near Dover, clerk, for an improved instrument for the measurement of angles. Sealed 2d November—6 months for enrolment.
- To Henry Venner Cocks, of Birmingham, iron founder, for certain improvements in stoves and furnaces. Sealed 2d November—6 months for enrolment.
- To Henry Crosley, of Hooper square, Leman street, civil engineer, for an improved batterie, or arrangement of apparatus for the manufacture of sugar. Sealed 7th November—4 months for enrolment.
- To James Murdoch, of Great Cambridge street, Hackney road, mechanical draftsman, for certain improvements in marine steam engines. Sealed 7th November—6 months for enrolment.
- To Thomas Yates, of Bolton-le-moors, manufacturer, for certain improvements in the construction of looms for weaving, and also the application of the same in order to produce certain descriptions of goods or fabrics by steam or other power. Sealed 7th November—6 months enrolment.
- To George Hanson, of Huddersfield, plumber and glazier, for certain improvements in the construction of cocks or taps for drawing off fluids. Sealed 7th November—6 months for enrolment.
- To Thomas Whiteley and John Whiteley, of Stappelford, near Nottingham, lace makers, for improvements in warp machinery. Sealed 7th November—6 months for enrolment.

To John Thomas Laurente Lamy Godard, of Christopher street, Finsbury square, merchant, for improvements in looms for weaving, to be worked by steam or other power, being a communication. Sealed 7th November—6 months for enrolment.

To John Jones, of Westfield place, Sheffield, for an improved table knife. Sealed 7th November—6 months for enrolment.

To Edmund Moody, of Maiden Bradley, Wilts, yeoman, for improvements in machinery for preparing turnips, carrots, parsnips, potatoes, and all other bulbous roots, as food for animals. Sealed 7th November—6 months for enrolment.

To Thoms Edmondson, of Manchester, clerk, for certain improvements in printing presses. Sealed 9th November—6 months for enrolment.

To James White, of Lambeth, engineer, for improvements in machinery for moulding clay to the form of bricks and tiles, and also for mixing, compounding, and moulding other substances. Sealed 12th November—6 months for enrolment.

To William Chesterman, of Burford, Oxford, engineer, for improvements in stoves. Sealed 12th November—6 months for enrolment.

To Moses Poole, of Lincoln's inn, gentleman, for improvements in making nails, bolts, and spikes, being a communication. Sealed 12th November—six months for enrolment.

To Moses Poole, of Lincoln's inn, gentleman, for improvements in looms for weaving, being a communication. Sealed 12th of November—6 months for enrolment.

To William Wisemann, of George yard, Lombard street, merchant, for improvements in the manufacture of alum, being a communication. Sealed 16th November.

To John Burn Smith, of Salford, Manchester, cotton spinner, for certain improvements in machinery for preparing, roving, spinning, and twisting cotton, and other fibrous substances. Sealed 16th November—6 months for enrolment.

To Miles Berry, of the Office for Patents, Chancery lane, patent agent, for an invention or discovery by which certain textile or fibrous plants are rendered applicable to making paper, and spinning into yarns, and weaving into cloth, in place of flax, hemp, cotton, and other fibrous materials commonly used for such purposes, being a communication. Sealed 19th November—6 months for enrolment.

To Francis Worrell Stevens, of Chigwell, Essex, schoolmaster, for certain improvements in apparatus for propelling boats and other vessels on water. Sealed 19th November—6 months for enrolment.

To John Parsons of the Stag Tavern, Fulham, victualler, for improvements in preventing and curing smoky chimneys. Sealed 21st November—6 months for enrolment.

- To Robert Hawthorn and William Hawthorn, of Newcastle-upon-Tyne, civil engineers, for certain improvements in locomotive and other steam engines, in respect of the boilers and the conveying of steam therefrom to the cylinders. Sealed 21st November—6 months for inrolment.
- To John Faram, of Middlewich, Chester, gentleman, for certain improvements in the mode of constructing, applying, and using railway switches, for connecting different lines of railway, or two distinct railways, and for passing locomotive steam and other engines, and railway carriages and waggons from the one to the other of such railways, and for certain apparatus connected therewith. Sealed 21st November—6 months for inrolment.
- To Pierre Auguste Ducote, of Saint Martin's lane, for certain improvements in printing china, porcelain, earthen ware, and other like wares, and for printing on paper, calicoes, silks, woollen, oil-cloths, leather and other fabrics, and for an improved material to be used in printing. Sealed 21st November—6 months for inrolment.
- To William Daubney Holmes, of Lambeth square, Surrey, civil engineer, for certain improvements in the construction of iron ships, boats, and other vessels, and also in means for preventing the same from foundering; also in the application of the same improvements, or parts thereof, to other vessels. Sealed 23d November—6 months for inrolment.
- To John Hunt, of Greenwich, engineer, for an improved method of propelling and steering vessels. Sealed 23d November—6 months for inrolment.
- To Richard Hornsby, of Spittlegate, Lincoln, agricultural machine maker, for an improved machine for drilling land, and sowing grain and seeds of different descriptions, either with or without bone or other manure. Sealed 25th November—6 months for inrolment.
- To John Sutton, of John street, Lambeth, machinist, for improvements in obtaining power. Sealed 25th November—6 months for inrolment.
- To James Craig, of Newbattle paper mill, Edinburgh, for an improvement or improvements in the machinery for manufacturing paper. Sealed 25th November—6 months for inrolment.
- To Arthur Collen, of Stoke-by-Nayland, Suffolk, plumber, for improvements in pumps. Sealed 25th November—6 months for inrolment.
- To James Matley, of Manchester, gentleman, for improvements in apparatus or instruments for the cutting of cotton or the wicks of lamps, being a communication. Sealed 25th November—6 months for inrolment.
- To George Rennie, of Holland street, Blackfriars, civil engineer, for certain improved methods of propelling vessels. Sealed 25th November—6 months for inrolment.

LIST OF AMERICAN PATENTS,
Granted from January 15th to February 12th, 1840.

(CONTINUED.)

- John H. Stevens*, Assignee of C. E. Warner, New-York, making Drug-gists' and other Boxes. Patented January 15th, 1840.
- Dudley D. Sacket*, Westfield, Massachusetts, improvement in the Braiding Machine. Patented January 22d, 1840.
- Theophilus Somerby*, Wells, Maine, making Wrought Drawn Nails. Patented January 22d, 1840.
- F. H. Southworth*, St. Louis, Missouri, Tide and Current Water Wheel. Patented January 22d, 1840.
- George H. Crosley*, New Haven, Ohio, construction of Chimneys to prevent smoking. Patented January 28th, 1840.
- Young W. Short*, Oglethorpe County, Georgia, Grubbing Machine. Patented January 28th, 1840.
- Elisha W. Welsh*, Paris, Virginia, improvement in Grist Mills. Patented January 28th, 1840.
- Mahlon Smith*, Tinicum, Pennsylvania, improvement in the Plough. Patented January 28th, 1840.
- William and James Thorn*, Plainfield, New Jersey, apparatus attached to the Locomotives, for removing obstructions from the tracks.—Patented January 29th, 1840.
- Julius Willard*, Baltimore, Maryland, machine for making Bricks. Patented January 29th, 1840.
- James Baldwin*, Nashua, N. H. Shuttle for Weaving Cloth. Patented January 31st, 1840.
- Edwin Moody & Samuel Morrill*, of Andover, Merrimac County, New Hampshire, Self Tending Saw Mill. Patented February 8th, 1840.
- David Vance Rannells*, of Washington, Mason Co. Kentucky, machine for Sawing Stone in square, round, or other shaped blocks. Patented February 8th, 1840.
- Robert M. Smith*, Rutherford, Tennessee, mode of dressing Mill Stones. Patented February 8th, 1840.
- L. Bush*, Assignee of *Isaac Lowell*, Pendleton, N. Y. apparatus for preventing and checking the ravages of Fire upon buildings. Patented February 12th, 1840.

 From the great press of other important matter we are compelled to defer giving specifications of the American patents in this number. The list however will be found complete. Should it prove necessary an extra sheet will be occasionally added for specifications.

THE
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VOL. I.

[For the American Repertory]

MANUFACTURE OF WHITE LEAD,

OR CARBONATE OF LEAD.

(CONTINUED.)

ON the 13th June, 1836, *see Repertory of Arts or Inventions*, vol. 4, p. 307 a 311, *London*, 1837, a patent was granted by the British government, to John Ham, of Bristol, for "making White Lead or Ceruse." He prepared a chamber of indefinite dimensions, and of materials suitable to contain vinegar ; a pipe furnished with a cock passed through it near the bottom, for discharging the spent liquor, which by means of a branch pipe also serves for supplying the chamber with fresh vinegar. On the bottom of this cistern a leaden pipe, properly inflected, is led from side to side, several times, and at equal distances. A current of steam is made to pass through this pipe, till a thermometer adapted to the trunk described below, indicates a temperature of 170° F. in the cistern. A bed of tan, three or four feet thick, is placed on the bottom of the chamber, and its sides are also to be lined to the thickness of twelve inches, with the same material, or with horse litter, or straw. "On a level with the top of the lower bed of tan, a wooden trunk, five or six inches in diameter, passes out horizontally through the wall of the chamber in which a stopple is fitted, having an aperture through it about half an inch across ; the use of this trunk is to

admit a thermometer, to ascertain the heat of the chamber, and to afford a passage for the entrance of the air."

When the whole is thus disposed, the sheets of lead are spread over the bed of tan so as to come in contact with three sides of the chamber, having a vacant space between them and the fourth side. Another layer of sheets of lead is placed on rods a little above the first, but it is to fit closely to the first, third, and fourth sides, and the second side is to be left open between it and the sheets of lead, and a vacant space after this manner is to be alternately left open at the second and fourth sides of the chamber, so as to give a reversed direction to the current of the vapor of vinegar between the upper and under surfaces of each two successive layers of the sheet lead.

When the chamber has been nearly filled in this manner, the sheet lead is to be covered, first with boards, and then with tan or litter, in order to confine the vapor of vinegar, and coerce its action on the lead. Mr. Ham gives many other details of his process for making white lead, such for instance, as the insertion of pipes at various parts of the cistern, but which it does not seem necessary to mention, since the plan by which he proposed to effect his object, is based on erroneous principles, and could only result, as it did, in an entire failure.

It may be pertinent to the subject, to remark in this place, that the Editor of the *Repertory* criticised Mr. Ham's plan of making white lead, and proposed such a modification of it, as would permit a supply of carbonic acid gas, by the artificial means of a blowing apparatus, similar to that used by M. M. Lescure and Breschez, in their manufacture of the carbonate of lead, at Clichy; but the adoption of this proposal, would have availed him nothing; because, as before noticed, it is impossible to make white lead without the presence of oxygen, which is not contemplated by either M. M. Lescure and Breschez or Mr. Ham, although the latter names a trunk for admitting air, but which could not serve the purpose, because it was plugged up to prevent the escape and loss of the vinegar vapor.

Mr. Ham, in answer to the Editor's criticism, *see vol. 4, Repertory of Arts, p. 360 London, 1827*, seems to be aware of a difficulty in manufacturing white lead by any other process than

that of embedding earthen pots, containing vinegar and sheets of lead, in horse litter or tan, but clearly did not know how to remedy it; for he remarks, "the formation of carbonate of lead (white lead) by the acetic acid, has never yet been sufficiently explained; and all the experiments to produce it by the vapor of vinegar in conjunction with carbonic acid gas, without the assistance of decomposing vegetable substances, as an object of profit have failed."

He further remarks, that, "Montgolfier attempted it many years since in France, by passing the gas arising from burning charcoal over heated vinegar, and thence through cisterns containing lead in sheets, but did not succeed in causing the plan to be adopted in manufactories."

These quotations are made, to show that up to the above date, say 1827, Mr. Ham knew of many attempts, which had been made to improve upon the pot-process of making white lead, but which had failed.

Mr. George S. Howland, of the city of Brooklyn, in 1827, or 1828, "from hints taken from the Repertory of Arts," experimented for the purpose of making white lead. He exposed sheets of lead in a case or cask, to the action of the vapor of vinegar. "No air was introduced except what came through the fire of a furnace, but the experiment did not succeed." Mr. George A. Harrison took a patent from the United States Government, dated 20th July, 1831, for making white lead; his process consisted in forming an acetate of lead by exposing the granulated metal, alternately to the action of the oxygen of the atmosphere and distilled vinegar, and then decomposing the salt of lead in solution with sulphuric acid, thus forming a sulphate of lead; which as before remarked, though a beautiful white powder, is insoluble in linseed oil, and of very little value as a paint.

Mr. Samuel Wood, of Philadelphia, attempted some years since, to make white lead at Norristown, Pennsylvania. He introduced carbonic acid gas alone to his lead during the continuance of his process. It also proved a failure. The list of failures might be continued much farther, but it seems unnecessary, since enough has been done to show that up to the year

1827 or 1828, the subject of manufacturing white lead does not appear to have been thoroughly understood ; not that chemists, and scientific works, were defective in detailing the constituent parts of white lead ; on the contrary, almost all of them state that oxygen gas, and carbonic acid gas, necessarily combine with lead to form carbonate or white lead ; but the processes for making this article which had been adopted prior to our knowledge of analytic chemistry, seem to have given such a degree of satisfaction as to neutralize the interest which usually stimulates to the investigation of similar subjects ; and it is probably owing to this circumstance, more than to any other, that this branch of manufacture was so long neglected.

In the year 1827, Mr. Edward Clark, then of this city, was requested to analyse some English White Lead, which he did, with great care, for the purpose of ascertaining the quantity of adulterating material mixed with it. At the same time he determined the constituents of white lead and their relative quantities, with a view to form white lead synthetically. To carry out his design he established a communication with a tin pipe, between a glass receiver containing sheets of lead, and a cup of vinegar, and a vessel which contained liquor in a state of vinous fermentation. The sheets of lead were so exposed, in a temperature of 60° to 80°F. for fourteen days, the supply of carbonic acid gas being continued by occasionally changing the attachment of the pipe to fresh casks of the fermenting liquor. The surface of the lead, after an exposure of thirteen hours, exhibited a greyish white color, and no other alteration took place, within the fourteen days, except, that the lead was slightly marked, as though the vapor of vinegar had condensed upon and run from it. He then adapted a pipe to a gas receiver, containing atmospheric air, and maintained a communication between it and the receiver which contained the sheet lead, so as to allow a slight discharge of the gaseous materials from beneath it. In twelve hours after the admission of atmospheric air, to the sheets of lead, they were entirely covered with white lead. The temperature was then raised to 90° or 100°F. The supply of vapor of vinegar and the gases being maintained, the lead was so far converted into white lead, that it gave way on the rods which

supported it, near the close of the fifth day after the admission of atmospheric air to it. This experiment was several times repeated, and always with the same result in respect to the conversion of the metallic lead to white lead; but there were some variations in respect to the time which was necessary to effect the change, but which no doubt were occasioned by difference of temperature, or want of the proper attention to render them uniform.

Mr. Clark next experimented in casks, and then in cisterns which contained a ton weight of metallic lead, and finally, in 1830, he adopted ranges of chambers, each chamber being about $12\frac{1}{2}$ feet long, 9 feet high, and $4\frac{1}{2}$ wide. Since that, however, he finds that chambers twelve to fifteen feet square, answer quite as well as those of smaller capacity, and that their use is more economical. These chambers are each respectively furnished with a vinegar trough, through which a pipe of about one inch calibre passes; it connects at right angles with a large main of steam pipe at one end, and is there commanded by a cock; the other end passes entirely through the trough and chamber, and there discharges the condensed steam. They are also each supplied with a gas distributing box or trunk, which is made about four inches square in the clear and about thirteen feet long. These are placed an inch or so above and over the vinegar troughs, having small holes at short intervals through their sides, and at one end are connected by means of a short pipe, to which a cock is also adapted, to a main gas pipe which is furnished by means of a blowing apparatus with the requisite supply of atmospheric air and carbonic acid gas. The sides of the chambers have cleits secured to them for supporting the rod over which the sheets of lead are suspended for conversion to white lead.

A boiler of iron or copper is heated with anthracite coal, from which the steam and carbonic acid gas are obtained for heating and supplying the chambers. The doors of the chambers fit close, so that some pressure is produced in them during the process of conversion.

The vinegar in the troughs, the sheet lead on the rods, and the cisterns being closed, fire is applied to the furnace of the

boiler, the blowing apparatus is put in motion, and the process of making white lead has commenced. Moderate quantities of coal and vinegar, and the constant attention of one man are necessary to continue it; and one thousand tons of lead may be operated on by this attention as well as one hundred. The largest size chamber will contain about ten tons of the metallic sheets, and require supplies of vinegar twice each twenty-four hours. If the lead appear moist and pasty, the vinegar is withheld; and, to these points, namely, the supply of the gases, and attention to the fires, the duty of the operative is confined. At first the vinegar was placed on the floor of the chambers and covered with a false floor, which was perforated at short intervals, so as to distribute the gases and acid vapor equally through them. In this way the sheets of lead became much more expeditiously converted to white lead, but its specific gravity was lessened, and consequently when adulterated, was too bulky for a saleable article; at least it was so esteemed by painters, but with what propriety we shall on some future occasion attempt to show. This arrangement will answer as well as the trough and trunk for distributing the gases and vapor in the chambers, but they are not so readily commanded, as there must necessarily be a much larger quantity of vinegar employed to cover the pipes. Therefore the first is the most convenient.

The metallic lead may be converted to white lead of equal specific gravity to that produced by any other known process, by simply diminishing the heat in the chamber, and employing more time to conduct the operation.

It is computed that from sixty to seventy-five per cent. of expense for converting metallic lead to white lead, is saved by the substitution of Mr. Clark's plan, for any of the old plans now in use; or, that the difference in favor of it is nearly as three to one. Whether this be correct or not, the fact of its requiring so much less labor, is an argument greatly in favor of its use, particularly as respects the health of the workmen employed in this manufacture, for the exemption from exposure must be *pro rata* to the labor saved. But when the buildings are well constructed, and well ventilated, the health of the workmen is seldom in

jured, if ordinary attention be paid to their cleanliness and regimen. We understand that Mr. Clark has been engaged in the manufacture of white lead on his plan for six or seven years past, and has not hitherto lost a workman by the painter's cholic, a disease which is prevalent amongst the workmen of most white lead manufactories, and often proves fatal.

We shall close this article by briefly stating, that letters patent of the United States of America were issued to Charles Ripley on the 11th day of July, 1837, about five months after his decease. The claims under this patent are, first, for the use of a main horizontal steam pipe, running in front or between rows of corroding chambers, of sufficient capacity to supply the whole of the lateral tubes connected therewith. Second, for the use of distinct lateral steam tubes, with returns, so that they enter and discharge from the same end of the vinegar troughs. Thirdly, he claims the vertical trunks and manner of governing the gases through them. And fourthly, he claims the construction of a shutter or door at the back of the corroding chambers.

We have read Mr. Ripley's specification with care, but do not discover any thing in it referring to any new process for manufacturing white lead. There is certainly nothing new in the arrangement of the main and lateral steam pipes, because they are described in Mr. Clark's specification, and have been in use at his white lead works for years before the date of this patent. The reflection of the pipe in the vinegar trough seems to be rather an injury than a benefit, since Mr. Clark finds that a single pipe is competent to supply a chamber 12 or 13 feet square with the vapor of vinegar; consequently double the capacity of pipe must involve double the expense, and also generate double the quantity of the vapor of vinegar required. The claim for regulating the distribution of the gases, it appears, should have been patented under the name of an improved stopple; for all that is effected by this arrangement for distributing the gases is equally well accomplished by the use of common brass or pewter cocks. The door or shutter communicating with the chambers, was also used by Mr. Clark before the date of this patent. He first used round cisterns, which

were furnished with main holes through their tops, but this mode of communication and this form of cistern were soon found inconvenient, and rectangular chambers, with moveable doors which admitted a ready communication for the workmen, were substituted for them as early as the spring of 1830.

By a careful examination and comparison of Mr. Clark's and Mr. Ripley's patents, we cannot discover, so far as they treat on the same subjects, any important difference between them; and by what means two patents, so nearly resembling each other in their specifications, could have been issued under dates so near each other, is altogether unaccountable.

Errata.—The reference to John Ham's Patent, in our last No. at page 94, near the bottom, was inserted through mistake. What follows it, refers to the paragraph preceding it.

OXYGEN GAS.

Account of some experiments made by Professor LEONARD D. GALE, to ascertain the proportion of Oxygen Gas taken up in the combustion of Charcoal; and the changes produced on Lead subjected to the action of certain agents; as elicited in the testimony given by him, in a suit in the District Court of the United States, between William Falconer and Edward Clark.

The Professor says, "I made five different experiments, and found that the average result was, that one third of a part in the hundred, or one three hundredth part of the air experimented on, (namely, the air after it had passed through the furnace,) was oxygen. In the first experiment the air that had passed through the furnace contained no oxygen at all; in the third experiment it contained the most oxygen of all the five experiments, and then it contained only one per cent. of oxygen; but in the third experiment the charcoal in the furnace was small in quantity, not over one and a half or two inches deep, and was so open that I could readily see the bars of the grate." An ordinary furnace, which chemists call a reverberatory furnace, similar to the one described by Montgolfier, was used for making these experiments. The Professor next remarks, that "carbonic acid gas alone has very little effect on lead. Vapor of vinegar has scarcely any effect, even when applied for years; for

thirty-six hours I have passed the vapor of vinegar through a coil of lead with no perceptible effect. Air alone has no effect, or next to it, provided the lead be pure. White lead, I have no doubt, cannot be made without oxygen gas. The agents calculated to make white lead, are air, acetic acid, and carbonic acid gas.

[For the American Repertory.]

THE ART OF BUILDING.

BY JAMES FROST.

No. III.

We have now to consider the properties of an entirely new system of incombustible floors and roofs, introduced within a few years in manufactories, and found so eminently useful therein as to have been since adopted into almost every description of building, from the cottage to the palace inclusive.

This system has been so favorably received, as to continue largely in practice in its original state, just as if it were incapable of further improvement; yet, on a review, we shall hereafter find it to offer as fair, full, and fruitful a field for the exercise of talent, as the different methods of vaulting, it has in so many instances effectually superseded.

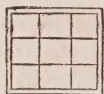
These floors consist of a series of cast iron beams (in plates with fillets cast thereon) placed on edge, a few feet asunder,  thus, to support narrow brick arches, upon which, stone or other materials being laid, constitutes a solid mineral floor, occupying about the same vertical space as a floor of timber, or a similar structure laid aslope and covered with composition, slate, or other surface, forms a durable and incombustible roof.

As the external arches of these floors and roofs press laterally against the walls of buildings, with a force limited by their small span, this small thrust is easily sustained by a few small transverse tie rods inclosed between the arches and floors.

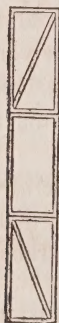
The weight of iron beams depending upon the span and load, and the thickness of the brick arches varying accordingly, the weight of the floors may be assumed to average from one to two hundred weight, to include most cases in practice. The

weight then, of these floors, approximates to the weight of modern groined arches and floors, but being in many respects very superior thereto, from requiring neither thick walls, nor buttresses, nor waste of valuable space ; they have nearly superseded all other vaulting, wherever space is valued or durability cared for. As the weight of these floors is always equal to, and in large floors frequently double the greatest load thereon, this circumstance alone increases the cost considerably, because the principal item, the iron beams, have to be formed sufficiently strong to bear the joint weight of the load and the floor. In practice other causes concur : long beams require to be made larger than actually requisite, to secure sound castings, and also to enable the beams to sustain transportation from the foundry to their place. From these united causes an unnecessary weight of metal is generally employed.

To improve these floors, and to lessen the expense thereof very considerably, I have employed another construction, altogether of beams and of arches. Instead of using a number of parallel beams at regular distances, I used a greater number of short beams placed at right angles : thus, for example,



over a room requiring four beams, twelve separate pieces were substituted ; and these pieces being also formed as trusses, the same strength was obtained with half the metal ; by that improved form, and as very sound and very neat castings could be produced of these small



dimensions, and transported, and fixed without difficulty, neater and better work accompanied a great saving of expense ; for these floors being thus subdivided into compartments, afforded an opportunity of introducing very thin and light tubular arches to support their floors, resting upon projecting fillets near the upper part of trussed beams, the lower edges whereof ornamented with projecting mouldings served to support a lower ceiling, and being cast upon an ornamented mould, these lower ceilings were very elegant, and at the same time very economical.

For although these four beams were composed of twelve pieces, accurately adjusted to an



equable bearing, they were so cast as to require little fitting; neither screw, rivet, nor bolt being required to connect them into a sound truss, strong as if of one piece of metal, whereby the walls were more effectually bonded than by any previous mode.

Floors of this kind, adapted to moderate sized dwellings, weighed only about thirty-six pounds the foot superficial, ceilings included, occupying scarcely the same space as timber floors, and more easily sustainable by their walls.

In many common apartments, as in stores, shops, kitchens, &c. wherever the lower ceiling might be dispensed with, and the trusses remain exposed to view, then all the vertical space occupied by these floors did not exceed four inches in height, an advantage previously unattained in mineral floors.

Were beams of iron, rolled as for railroad purposes and of a proper form, adapted for floors, and as they soon would be, were an extensive demand once established for them; with such beams and tubular arches, floors with ceilings of the most elegant forms could be obtained, occupying only half the space of the present combustibles; thus some part of the expense would be saved in the reduced height of buildings, or an equivalent advantage gained in the additional height of apartments, while the floors would also be much improved by the substitution of rolled for cast iron, and with reduced cost.

The peculiar, the great recommendation of the foregoing improved methods of mineral vaulting is, that flat or level ceilings are thus rendered compatible with security and economy of space, a circumstance so desirable as to be almost essential in modern dwellings and formerly unattainable without the most lavish expenditure of space in arches and abutments.

We have now to describe a method so easy and so economical, that all the advantages peculiar to the foregoing methods may be obtained by the proprietor of the humblest cottage.

For, having observed in practice, what strong and light work was produced by the use of hollow tubes in very flat arches, it occurred to me to attempt a flat floor or roof of tubes, to ascertain whether arches might not in many cases be advantageously dispensed with; and having succeeded in this novel and bold attempt, by cementing upon a flat temporary support a struc-

ture of tubes regularly bonded, and upon that a similar stratum crossing the first at right angles, on which cement being laid, a light, sound, incombustible, and inexpensive floor was produced.

As this new description of floor and roof promises great advantages in building, I shall proceed to detail its formation, capabilities, and advantages more at length.

In the first place, when the temporary supporting surface is smooth and level, a coat of plaster laid thereon, will form a sound air-tight ceiling, plainly finished without cost.

In the second place, when fillets, mouldings, or any cheap devices are laid upon the supporting surface, then the ceiling will be panned or enriched at exceeding small cost, when compared with the elegant embellishments which may be thus ingeniously and cheaply introduced.

Thirdly, as the tubes may be made of any size, or of any strength, or employed in any number of courses, great strength can be imparted to these floors in this simple manner.

Fourthly, a little consideration will show these floors to be capable of receiving any accession of strength, by other means than a mere increase of thickness; for these floors being laid upon the walls, may be built therein, or grooves being left in the walls for their subsequent insertion and secure fixing therein, in the manner of stone landings for geometrical staircases. The external portion of these floors so fixed, will thus acquire the strength of landings, without trenching upon the strength of the central portion of the floors, and this will be found of considerable advantage, because so large a portion of the floor will be thus sustained. In a floor twenty feet square, containing four hundred suppl. feet, more than one half the area is contained within the distance of three feet from the walls; now as three feet is but a moderate distance for stone landings to be thus supported, and any load of persons congregating thereon, and as these floors being thicker than stone landings, are thus proportionably stronger, the largest portion of the floor will be thus sustained, and support the central part of the floor, in possession of all its natural strength.

Fifthly, this natural strength is very considerable, because any sound homogeneous substance, supported on all four sides,

is twice as strong as if supported on two sides only ; and this may be easily proved by breaking similar pieces of slate or other substances, so differently supported, when it will be found to require twice the weight to produce two lines of fracture in the piece supported on four sides, as compared with the one fracture in the piece supported on two sides only.

Sixthly, before the floors could fail, they must be fractured through their extreme length and breadth, so that the strength of those external portions of the floor, free from cross strains, would sustain the portion of the floor so subjected to it in the centre.

Seventhly, their peculiar formation affords the greatest possible facility for increasing their strength to any extent, and at little cost ; for any quantity of tye rods may be introduced and securely fixed within these tubular structures, and be perfectly protected therein. If tyes of wood are employed, their cost will be trivial. If tyes of metal are preferred, their cost will not be great, because the great tensile strength of the material may be secured in its full efficiency.

That the smallest possible use of this expensive material for building purposes is desirable, must be allowed by all who will inquire how extravagantly it is commonly employed for those uses, and what a surprisingly small effect is generally produced and actually obtained, as compared with the absolute strength and value of the substance so employed. If a clear view of this important fact is obtained, it must precede and induce some real improvement.

In Tredgold's tables, a beam of cast iron one inch thick, twelve inches deep, placed edgeways upon bearings twenty feet asunder, is assigned as a full load upon the centre of the beam, 6. 120 pounds, or less than three tons, for the full duty to be obtained by the use of this quantity of cast iron.

Now the same sectional area of cast iron would suspend eighty tons ; the same sectional area of bar iron would suspend three hundred tons ; the same sectional area of cast iron of a proper form, (and all proper forms of cast iron, are equally expensive) would support six hundred tons. How trivial, ineffective, and costly, then, is the present use of cast iron as in beams,

and on such an extensive scale too ! How desirable some economical substitute or improved use of this material !

To investigate the cause of this astounding misapplication of means, may lead to the discovery of a remedy.

Let us then consider the state of a beam when loaded. It is then tasked with the performance of two distinct and opposite functions. It has to resist compression at the upper edge, and to resist extension at the lower edge, and each function is performed with full effect and efficiency at or near to the edges only ; for just as much as the parts of the beam in these opposite states approximate, they just as much decline in efficiency ; and some central part of the beam being neutral, the adjacent parts are of very little utility though strained to the utmost by intense leverage, and the opposite states of the opposite sides neutralize and destroy a principal portion of the efficiency.

Hence the use of iron, as in these beams, should be avoided as much as possible ; and we shall happily hereafter find them to be capable of the most important and economical improvements.

In stores and warehouses, wherever strength is preferred to appearances, where flat ceilings are unessential, we may consider that beams having been employed merely as a compound arch and abutment to support other arches, that light arches may be at once substituted for this complex series of beams and arches ; provided only, sufficient abutments can be constructed and obtained at little cost, to resist the great lateral pressure of arches, within lofty and thin walls.

Now, because it is obvious to all that a lofty and thin wall cannot withstand the lateral pressure of an arch against it, it has been too hastily concluded by all to be unable to resist such great force ; but, be it well remembered, a thin wall is capable of resisting a great force endways, though it is not, sideways ; and, by connecting two walls by diagonal ties, all the lateral pressure of the arch will be resolved into a force only tending to overset the walls endways ; and as this force is controllable by common plain bonds, sufficient abutment may be thus procured to sustain flat arches of double curvature, within thin and lofty walls.

Thus a most useful and most important object, hitherto deemed impossible by theoretical men, and impracticable by practical men, is shewn to be easily accomplished. The same remarks are equally applicable to groined arches.

The groined arch, so peculiarly deserving attention may be as securely supported within thin walls, by being placed upon small return walls or piers, constructed to receive the foot of each groin, as all the lateral pressure of these arches is there concentrated. These piers properly proportioned will so strengthen the walls, and so reduce the lateral pressure of arches, as to be easily supported with plain and cross bond, the latter concealed between the arches and floor.

The general nature of these arches and floors for dwellings were described in my last paper. When adapted to stores or warehouses they will not weigh, it may be stated, in general terms, more when loaded, than arches and incombustible floors as usually formed weigh when unloaded; will occupy only the the same place as timber floors; require no unnecessary sacrifice of valuable space; and will be found, absolutely, much more inexpensive, if a fair allowance be made for the certain contingent cost of insurance on inflammable buildings and their valuable contents, (frequently invaluable.)

Thus personal comfort and security will accompany individual profit and national advancement.

(TO BE CONTINUED.)

Washington, February 20, 1840.

JAMES J. MAPES, ESQ.

Sir, I have had an opportunity of looking over the first number of the American Repertory, published by you, and highly approve of its general object.

It is a time when great good may be done to the arts, to the cause of industry, and to the prosperity of labor, by a wide diffusion and extension of the more important and practical branches of knowledge.

I happen to have an account of "ORAM'S COMPRESSED FUEL," for Steam Engines, which I do not remember to have seen pub-

lished in the United States. I send it to you for publication in your periodical, if you think proper.

With respect, your obedient servant,

DANIEL WEBSTER.

ORAM'S COMPRESSED FUEL.

It gives one third more heat than coal.

It occupies one third less space than the same quantity of coal.

It does not waste by friction, nor is it damaged by atmosphere.

It does not corrode or injure iron.

It emits very little if any smoke, and no smell.

It does not clinker or cake.

It lasts longer in heat than coal.

It is better ballast.

And it can be manufactured and sold at the same price as coal, with a large profit.

Result of trials at Woolwich Dock Yards, upon a Ten-Horse Steam Pumping Engine, working six hours and three quarters, at 42 elevations per minute, and discharging 30 cwt. of water per minute. Made at the request of the East India Company, and under the direction of Government.

The report was made by Mr. EWART, the chief engineer.

July 24, Engine worked $6\frac{3}{4}$ hours,

Oram's Compressed Fuel, consumed, ... 750 lbs.

“ 25, Same engine, same time and work,

Wylam main coal, consumed, ... 1128 “

“ 26, Same engine, same time and work,

Welch (Llarnpaineck) coal, consumed. 1046 “

“ 27, Same engine, time and work,

Pontop, carefully picked by hand,

from ship, consumed. 938 “

“ 28, Same engine, time and work,

Oram's Compressed Fuel, (2d trial). 680 “

The smoke from Oram's fuel, is much less than from coal, and steam got up sooner, and with much less fuel.

The result is in saving of one half in stowage.

Thus, as 680 pounds will do the work of 938 pounds, this 680 pounds will only occupy the space of 453 pounds instead of 938 pounds, making a saving of 485 pounds in 938 pounds.

Cost of manufacture, per ton.....	5 s.
Price of coal at Newcastle, per ton.....	10 s.
South Wales, Llanelly, &c.....	12 s.
Milford Haven,.....	18 s. & 19s. 8d

The mode of manufacturing the above will be given in a future number. Ed.

For the American Repertory.

TRANSACTIONS OF THE
LYCEUM OF NATURAL HISTORY
IN THE CITY OF NEW-YORK.

OFFICERS, 1840.

<i>President,</i>	JOSEPH DELAFIELD, ESQ.
<i>First Vice President,</i>	DR. JOHN AUGUSTINE SMITH.
<i>Second Vice President,</i>	ABRAHAM HALSEY.
<i>Corresponding Secretary,</i>	JOHN H. REDFIELD.
<i>Recording Secretary,</i>	ROBERT H. BROWNE.
<i>Treasurer,</i>	DR. J. C. JAY.
<i>Librarian,</i>	ISSACHAR COZZENS.

Curators,

R. H. BROWNE,	DR. JAMES E. DEKAY,	DR. J. C. JAY,
B. W. BUDD,	J. BELL.	

P R O C E E D I N G S .

March. Mr. Carey from the committee to whom was referred the China Quince, presented by Dr. FRANCIS, reported it to be the Cydonia Sinensis, D. C. or Common Quince.

This specimen is four or five times larger than the fruit raised in this country, and is the ordinary size in China.

Dr. DeKay, presented the report of the geological survey of the state of Michigan. He also stated that it had been ascertained that eggs laid by an unimpregnated fowl, remained unchanged and perfectly fresh, after having been under the bird six weeks; and suggested that from the property of preserving their freshness, such eggs would be valuable for sea voyages.

Mr. Storer, presented through Dr. DeKay, specimens of iron ore from Frostburgh, Maryland, accompanied by the following results of analyses :

By Dr. Chilton.

	First Analysis.	Second Analysis.
Iron -	45	36
Silex - -	8	7
Magnesia -	8.3	5.4
Carb. Lime -	4	3.2
Alumine -	4	3.5
Carbon -	2.4	2.4
Car. Acid, }	28.3	41
Oxygen, &c. }		
	100	98.5

By Dr. Jones.

	First Analysis.	Second Analysis.
Iron - -	43	53 7
Silex - -	14	6 3
Alumine -	8	2
Water and } Oxygen, }	35	38 *

* Carbonic Acid

The same gentleman also laid before the Society, specimens of Bituminous Coal, from the same locality with the following analyses :

	Carbon.	Bitumen.	Alumine and Iron.	Water.	Silex.
By Dr. T. P. Jones -	78	19	3	0	0
Dr. Jackson - -	77.09	16.05	3	0	3
Mr. Hays - -	77.8	15.6	0	0	4.6
Prof. Ducatel -	70	20.5	6	3.5	0
Dr. Chilton - -	86	2 Hyg'n 9		2	0

Dr. Feuchtwanger exhibited the skull of a Marmot, the incisors of which had grown to an unnatural and monstrous size.

The second annual report of the geological survey of Pennsylvania, and the first report of the geological survey of Ohio, were laid before the Society.

Mr. C. DeRham, presented Temminck's Manual of Ornithology in three volumes, and the History of Fishes by J. T. Klein.

LECTURES AT THE MECHANICS' INSTITUTE.

Among the weekly lectures which have been delivered, during the season before the Mechanics' Institute, we cannot help noticing one, by Dr. QUIN, on the Mechanic Arts; as well from the intrinsic importance of the subject itself, as from the correct view which it gives, of the *importance* of the Mechanic Arts, and the justice it does to our native mechanics. The subject,

we are well aware, is one of too extensive a nature to admit of being even partially treated in a single lecture; and we hope that in another season, the Doctor will take up the subject in a more minute and extended manner, and exhibit the labors and talents of his countrymen, together with their *practical* results, as compared with those of other nations. There are more patents taken out at Washington in a single month, than in London during an entire year; and we have often thought, that in justice to the inventors, and to the nation at large, the practical and ingenious application of useful mechanical principles should receive some other reward than merely a place on the catalogue of patents.

After a brief introduction, the lecturer proceeded to show the *importance* of the mechanic arts, in the successful prosecution of scientific investigation; in works of usefulness, Artesian wells, for example; in the successful and rational prosecution of agriculture; in the formation of articles for the convenience and comfort of mankind.

The debt of science to the mechanic arts was next touched upon; of astronomy, and natural philosophy, for the lenses which have produced such mighty discoveries; of comparative anatomy, for the astonishing, microscopic discoveries of Leuwenhoeck; of descriptive anatomy, for establishing the last link in the chain of the circulation; of the whole world, for the practical application of the expansive power of steam.

The lecturer then went into an enumeration and description of the monuments of ancient art, in India, Egypt, Greece, and Italy. We here felt that he was too much circumscribed in his limits, and that this division of the subject was sufficient to have occupied an entire lecture. As it was, the mass of information given was highly instructive and entertaining, and was received with approbation by one of the finest audiences of the season. He spoke of the ruins of Carnac and of Luxor, of the Pyramids, of lake Moeris, of the statue of Memnon, of the Sphinx, of the temple of Isis at Dendera, and of the effect of these mighty remains upon all subsequent ages.

He next mentioned those of the middle ages, as having a character differing from those of antiquity, and forming a connect-

ing link with the structures of the present day. He adverted to the leaning tower of Pisa, to the tempering of the Scottish broadsword and claymore, of the Swiss steel cross-bow, of the Japanese sword blade, &c.

Speaking of those of our own days, he says, "but the mightiest triumphs of the mechanic arts have been reserved for our own day. The greatest illustration of the power of the *screw*, has been exhibited in the streets of New-York, in the moving of houses of every size and shape. An English gentleman, a particular friend of mine, who had resided in this country for some time, having returned to Europe, to visit his friends, was narrating to some of them the mode in which he had seen houses of great size lifted from their foundations, removed to a distance, and then elevated from fifteen to twenty-feet, above their former level; and was immediately greeted with a cry of "travelers' tales." But most of my audience know this to be a fact. It is but just to mention, that the gentleman, who has been chiefly instrumental in bringing about these wonderful results is a *mechanic*, a member of this institute, Mr. Brown. This gentleman is now ready to contract to pass a saw through the City Hall, dividing it into three portions, and to remove it to the Battery, and that too, without disturbing a spirit level in any part of the building. Even the celebrated Brunel, of whose fame the Thames tunnel will remain a lasting monument,

"Monumentum ære perennius,"

would ridicule the idea of such an application of the *saw* and *screw*. A similarly Herculean task was offered to be performed in ancient times, by a sculptor, named Dimocrates, who proposed to Alexander the Great, to cut Mount Athos into a statue of the king, holding a town in his left hand, and in his right hand, a spacious basin, to receive all the waters which flowed from the mountain. Alexander, however, although he greatly admired the plan, did not choose to accept the offer. In our own country, the cotton gin will perpetuate the name of Eli Whiting to the latest posterity; every spindle throughout the world echoes his fame, and stands a monument of his genius. But I can scarcely do more than enumerate a few of the many

vast improvements in the mechanic arts, which characterize this age, and, to a great extent, this country. Who, some few years ago, would have dreamed of the rapidity, economy, and convenience of traveling, by means of those mechanical contrivances, railroads? To descend to smaller matters, even *shingles* and *staves* are now produced by a machine, having the power of 100 individuals, capable of being controlled by the single arm of one."

We make room for the following extract, on the comparison of the present state of the mechanic arts with that of past times, as contrasted with that of literature, at the same periods.

"The present state of the arts and sciences, as contrasted with that of literature, is not at all in accordance with their comparative state in past times. The poems of Homer, the earliest, almost, of which we have any record, stand to this day, an imperishable monument of genius, unrivalled and transcendent. But the condition of the mechanic arts, even at a much later period, was far behind. True, certain fixed principles were as well known then as they are now; as for example, the loss of power attendant upon the increase of velocity, and *vice versa*. But the *application* of these principles in all their ramified usefulness, was left to modern days.

Every spool of cotton wound by machinery is a greater feat of mechanic skill than the erection of the vast pyramid of Cheops. My fair hearers, who are, no doubt, better acquainted with the quality of the cotton, than with the mechanical contrivance for putting it in the form in which they see it, will be surprised to learn, that the machine by which that operation is performed is one of the greatest triumphs of modern mechanic art. It will be borne in mind, that, as the spool in the process of winding, increases in diameter, its speed must be lessened in an exactly proportionate ratio; as a variation of the 1000th part of an inch in the entire length of a spool of cotton, would be sufficient, either to break the thread, or to cause it to lie loosely around the spool." "The governor of the steam engine, surpassed only by the human mind, and omnipotent in its operation, is but one among the many transcendent beauties of modern mechanical application. Berlin castings of the pre-

sent day, are as keen and sharp as the work of the graver. I have, lying on the table, a splendid specimen of these castings, in the form of a lady's cast iron necklace, which may be examined by any lady or gentleman, at the conclusion of this lecture. I have seen cast iron breast pins from the Berlin works, so cleanly and delicately cast, as to challenge comparison with similar ornaments of wrought gold." "The most wonderful machine, however, invented within the last few years, is *Trench's paper mill*. By this invention, the crude rags are converted into a printed volume, without leaving the machine. Not only is the paper made and printed, but it is also cut into sheets and laid ready for the binder. We can have a volume bound and gilt, in forty minutes from the time the crude rags are put into the machine. Thus, a person may walk into the mill, deposit his cast off linen in one end of the machine, and see it come out Robinson Crusoe at the other! A poor student, in the fall, may deposit his summer clothes in the machine, and walk away with his winter reading under his arm!"

Since the delivery of this lecture, the inventor of this machine, Mr. Trench, has deposited in the rooms of the Mechanics' Institute, a single sheet of paper, containing six copies of Town's Spelling-book! He further asserts that he can manufacture, if desired, one single continuous sheet of paper a mile long! The lecturer then notices the *steam guage*, or steam indicator, a description of which may be found in the first number of this work.

The individuals to whom we are indebted for such mighty inventions, are next noticed, from the time of Archimedes, down to the present day. In our own country, he pays a tribute of merited praise to the talents of Fulton, Stevens, Whitney, Bogardus, Durand, Miner, and others. "The tobacco cutting machine, built under the superintendence of the last named gentleman, shows that an area of 144 square inches, may be so minutely cut as to divide each inch of depth into 1000 well defined and distinct parts; and the machine could be so graduated by an index, as to make any number of cuts, from 1 to 1000 in the inch." We make room for one more extract.

"On a comparative survey of the works of the ancients and

of the moderns, we perceive that the great distinctive characteristic of the ancient works of art, is *grandeur*, as the result of immense labor and vast masses of material. It is supposed, and with good reason too, that the Israelites were employed in the erection of the pyramids; indeed we have the positive testimony of Josephus, that such was the fact. The Israelites were in Egypt 215 years, during 70 of which Joseph ruled. Now, if we allow 40 years for the extent of the generation which succeeded Joseph, at which time the scriptures tell us that "a new king arose who knew not Joseph," we have left 105 years as the period, during which, no doubt, the enslaved Israelites were engaged in these gigantic works. The largest pyramid, that of Cheops, is 477 feet high; i. e. 70 feet higher than St. Peter's, at Rome, and 133 feet higher than St. Paul's, London, the length of the base 720 feet, covering an area of 12 acres. Pliny and Diodorus inform us, that 360,000 men were engaged for 20 years in the erection of this pyramid. We may here take the opportunity of remarking, that we have the concurrent testimony of all ancient authors, that it was the uniform practice of the oriental nations, to employ captive foreigners in the erection of laborious and painful works. The *labyrinth* was an enormous structure of marble, containing 3000 chambers, 1500 of which were under ground, and set apart for the sepulchres of the kings who built the labyrinth, or for the abodes of the sacred crocodiles. The *catacombs* were subterraneous galleries of prodigious extent, hewn in free-stone rock, and designed as the sepulchres of the ancient kings."

"We may now form some idea of the magnitude of these enormous works. And yet, in their construction, not one new principle was involved, nor any novel application of one previously known. They depended for their effect, entirely upon the vastness of their dimensions, and the exhibition of untiring perseverance, and mere brute force. There is more of mind, more of ingenuity, more of every thing that distinguishes man from the brute creation, in the production of a simple cambric needle, than in the erection of a world of pyramids."

We shall notice in turn, some other lectures, delivered this season.

For the American Repertory.

NATIONAL ACADEMY OF DESIGN.

Instituted January 19, 1826. Incorporated April 5, 1828.

The schools for instruction, in this institution, which have been open for the benefit of students in the art, during the winter evenings, will close for the season on the 10th inst. by distributing to the successful candidates the prizes usually awarded to excellence in the various classes of scholastic membership. The premiums offered this season, in the "*Life and Antique Schools*," are as follow :

The large silver palette, for the best drawing in chalk from the "living model," and the smaller silver palette in the same class, for the second best drawing from the same. In the "Antique School," the first premium, a large silver palette for the best drawing in chalk from the *Venus de Medicis*, and the smaller silver palette in the same class for the best drawing in chalk, from Hudson's anatomical figure. C.

[The above is furnished us by a member. The names of the successful competitors, for the above premiums, we shall give when they transpire.]

The fifteenth Annual Exhibition of this institution will open to the public on or about the 15th inst. We have been at some pains to ascertain what pictures are in progress, and take pleasure in anticipating in part, the gratification which our readers will receive from viewing the collection.

F. S. Agate, N. A. This gentleman has a full studio, from which we understand he will select for exhibition, a family group of a mother and child, and a portrait of a young lady; both of which are in his happiest style.

J. L. Morton, N. A. has just completed a fine view of North River scenery; also, an interesting family group, both of which are highly spoken of.

J. Whitehorne, N. A. Among other pictures by this artist, we may expect one, of two half length figures, very happily grouped with a pleasing arrangement of light and color. Also a full length of a child, well designed and colored, amusing

herself with the hoops and sticks used in the game of "Graces." Another little urchin has his hand buried in the snowy coat of a French poodle, tugging to remove his favorite to a more convenient spot for sport and play. A portrait of the artist's little son struck us as among his happiest efforts. The color and expression are very good.

W. J. Bennett, N. A. We may expect two views from this gentleman, and can pay them no higher compliment than to say they were designed and painted by himself.

T. S. Cummings. We may expect a few pictures from our valued tutor, and we hope the group spoken of in our last number, which is certainly the most extensive composition in miniature since "the hours" of the lamented Malbone, may be found among them.

Two portraits lately finished, which we understand will be exhibited, are most striking likenesses. We are acquainted with the originals, and therefore speak with certainty.

J. G. Clonney, A. will furnish a composition, which is said to surpass that which he exhibited last year, if so it can receive no better compliment than the statement of this fact.

L. P. Clover. Studio of a Phrenologist, containing some real portraits. This gentleman has relinquished the burin for the brush, and, we understand, with much promise.

Thomas Cole, N. A. is engaged in painting a series of pictures after the manner of his Course of Empire. Those who saw that series are fully able to enjoy even an anticipation of this master's work.

A. B. Durand, N. A. will furnish two large landscapes: the subjects are "morning and evening of life." Mr. D. long held the first place as an engraver, in this country, and has not lost rank by his change of profession; he has been correctly called the Crichton of Art.

F. W. Edmonds, A. This gentleman seems to select excellence in all the walks of life, and claims it as his own. His talents as a financier are too well known to require even a reference; while, as an artist, his compositions of last year place him at the head of amateurs, and even on a *par* with professionals.

James Frothingham, N. A. has just finished a fine portrait of the Rev. Orville Dewey, which we understand is to be engraved in mezzotinto; the original portrait will doubtless grace the walls of the Academy.

George Hite. This gentleman's miniatures are highly creditable, and we hope will again grace the exhibition. As likenesses they are unexceptionable, and as he is painting many, we may fairly hope to see some at the Academy.

Charles Ingham, N. A. This artist has long enjoyed the cognomen of the modern Gerard Douw, and his highly finished female portraits fully entitle him to such a distinction; we understand his head of the late lamented Vice President of the Academy, (William Dunlap, Esq.) is a remarkable likeness, and fully supports the well earned reputation of the artist. In addition to this picture he will also exhibit a portrait of G. C. Verplanck, Esq. and some full length portraits of children.

H. Inman, N. A. Is engaged in painting one of the historical pictures for the Rotunda, at Washington, and undoubtedly will fully sustain his well deserved reputation. This great work will not prevent his contributing to the exhibition some of the beautiful full lengths and groups which have lately emanated from his pencil.

W. S. Mount, N. A. Some of Mr. Mount's friends assert that we shall have three compositions from his easel, by the 15th inst. The Wilkie of America is too well known to require comment.

W. Page, N. A. We expect to be gratified with several portraits from this artist, in addition to the *chef d'œuvre* spoken of in our last number.

John E. Prudhomme, A. will contribute a frame of his usually elegant specimens of stipple engraving.

Andrew Richardson, N. A. Has several landscapes in his happy and spirited style. One taken on the Hudson, near Bloomingdale, is a fine specimen of sunny effect. Mr. R.'s late visit to Europe has ripened a taste fully able to appreciate the beauties of Claude, without forgetting that Italian skies could not be found over American scenery. He has lately made some

successful essays at miniature, proving a versatility of talent which fully sustains his reputation for industry and taste.

H. C. Shumway, N. A. This artist is now in Washington, painting a portrait of the Hon. Henry Clay, for Mr. Lee of this city. Our readers have only to recollect his picture of the late Rev. Mr. Mortimer, the "Greek," and those of the last exhibition, to anticipate much from his present endeavor.

R. W. Weir, N. A. This artist is engaged at West Point, painting a picture for government. His studio being out of the city, we are unable to say whether he will prepare any thing for exhibition.

There are doubtless many others who will, as usual, surprise the friends of art; and we shall be very happy to do their works full justice on the opening of the exhibition.

[For the American Repertory]

EFFECT OF ACID VAPOR ON BRASS WIRE.

PROFESSOR MAPES :

Dear Sir : I noticed the following curious circumstance, a few days since, and although a similar thing, may have been observed before, by others, yet so far as my memory serves me, I have not heard of it, nor seen it noticed in any publication. If you consider it novel, you are at liberty to use my remarks in your Journal.

Two coils of brass wire, of different sizes, No. 4, and No. 25, have been hanging up in my laboratory for three or four years, in a situation where they have been more or less exposed to acid vapors. Having occasion to use a piece of the large wire I was surprised to find that it was exceedingly brittle; the least attempt to bend it caused it to break into three or four pieces. On examining the broken surface, it was observed to be highly chrysaline and bright. The coil of fine wire was found to be in the same state. On heating a piece of it to incipient redness a blue light vapor passed off, and on cooling, it was found to be as soft and pliable as copper.

A portion of the wire, in small pieces, was heated in a close

tube ; it emitted a white vapor, which condensed on the upper part of the tube, and which, on analysis, proved to be chloride of zinc.

Yours truly,

JAMES R. CHILTON.

The above article by Doct. Chilton will furnish a useful hint to mechanics. The brass wire there spoken of was undoubtedly composed of copper and zinc. From the results shown, it is very evident that the brass used for chemical and philosophical apparatus, ornamental or useful brass work, for laboratories or drugstores, should be composed of copper and tin only.

ED.

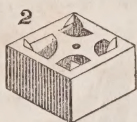
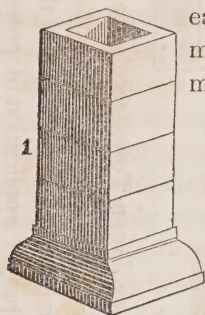
Report of the Committee on Arts and Sciences of the Mechanics' Institute, upon JORDAN L. MOTT'S Cast Iron Fronts for Stores.

In consequence of the many disastrous effects arising from fires where granite columns are used to support store fronts, the committee have felt it their duty to examine the subject with great care.

When granite is suddenly heated, or suddenly cooled, the outside will immediately crack off; this renders it a very unsafe material for the purpose to which it is, as above named, too often applied. Repeated accidents to firemen, while attempting to save property in stores so constructed, have latterly induced a needful caution, that makes their efforts, under such circumstances, in many cases almost ineffective.

Iron columns have already been used in store fronts, but so constructed as to be little better than granite; they are usually in the form of cylinders or pipes, and of so great a height, that if a part only becomes heated, it will be so expanded as to crack the cold or unexpanded part, and thereby endanger the building. It has also been *proposed* to use iron slabs or pilasters in front of brick pillars. Under such an arrangement, the committee are of opinion, that the iron would still be liable to crack from unequal expansion, and thus bring the entire weight on the brick pillar, probably to the destruction of the wall; or, should the pilaster not crack, its expansion would raise the front from the bricks, and bearing only upon the outer edge of the wall, would cause it to trip and fall.

The plan proposed by Mr. Mott, obviates all these difficulties, and at the same time admits of larger openings for doors or lights, than any other at present in use. His columns are cast in sections, as represented in fig. 2, and superimposed upon each other, forming a column, fig. 1. They may be made square or round, plain or ornamental, as fancy or necessity may dictate.



Each section is cast with a cross or other inside support, so as to connect the four sides firmly together, with inner projections at the corners, or grooves on the edges, that shall keep them in place, and cause the column to maintain an upright position. In the

centre of the cross is a hole as represented in the cut, to admit a wrought iron rod the whole length of the pillar, with a nut on each end, which binds all the parts firmly together, and adds much to their general strength. It will be perceived, that these sections may expand and contract, all or singly, without the chance of cracking a cold section by expansion; and from each section being so small, it is not probable it would crack, even if wetted suddenly, while hot; but if it should, the pieces could not fall out, each part of the section being held in place by the grooves, cross, or inside projections.



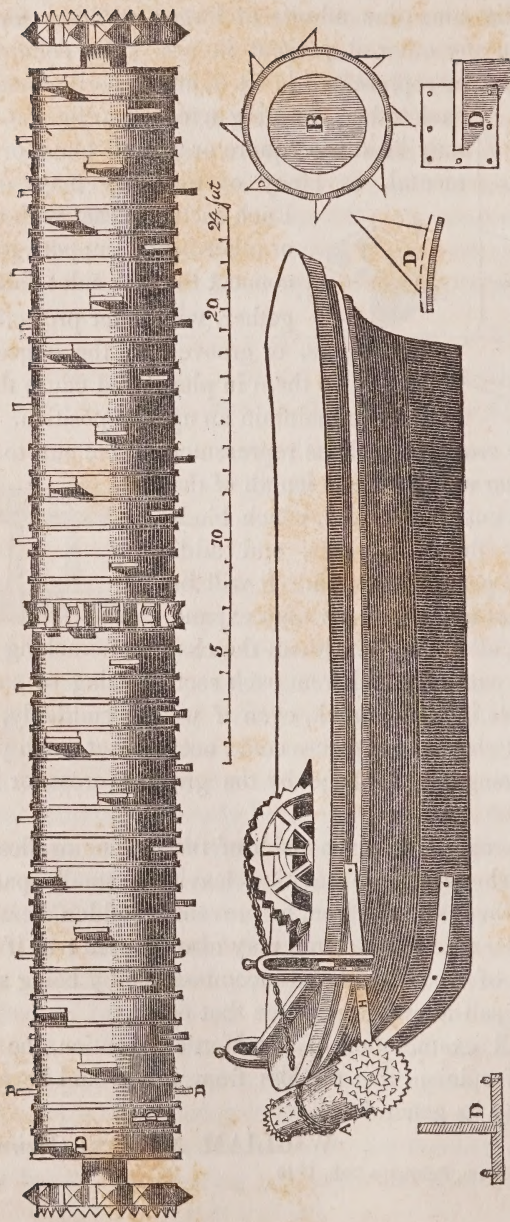
Mr. Mott proposes to place inside of these columns, fire brick of the exact shape of the cavities, leaving a small space for air between them and the iron, to prevent a sudden heating of the brick. Steatite (soap stone) may also be used; or if desired, a column of wood, rendered incombustible by being saturated with any salt known to produce that effect.

After a full examination of Mr. Mott's invention, the Committee are of opinion, that the loss from fire would be greatly diminished by its general use.

WILLIAM A. COX, *Chairman.*

Mechanics' Institute, February 18th, 1840

TOWNSEND'S ICE BREAKER.



Report of the Committee on Arts and Sciences of the Mechanics' Institute, upon JACOB TOWNSEND'S Ice Breaker.

The Committee are of opinion, that the invention offered for their consideration by JACOB TOWNSEND presents a combination of effective forces sufficient to easily break the ice formed in our bay and the rivers emptying into it, during a winter of ordinary severity; and that by a proper application of power to the

machine to progress through ice may be increased to such an extent as to make it a valuable invention. The full scope of its usefulness, however, will be better ascertained by experiment, as is the case with all inventions, and more especially those in which an application of mechanical laws is intended to counteract an irregular operation of natural laws.

Description: A, is a cylinder, with its periphery and ends armed with strong iron hooked and wedge-shaped teeth, D. This cylinder may be made of wood, in the usual manner, and have the teeth fastened on its periphery by means of strong iron hoops bending over flanges cast upon the base of the teeth; or, it may be formed entirely of iron, cast in rings or zones, and united in a manner similar to iron water pipes. This cylinder is suspended horizontally in front of the boat by an arrangement that permits of its being raised or lowered at pleasure. H, arms enclosing the gudgeons of the cylinder, and attached to the sides of the boat by strong iron bolts. G, a beam supporting the yokes or stirrups in which the arms rest. K, a chain band to communicate motion to the cylinder; passing over spurs on the cylinder and a cogged ring on the spur wheel.

The arrangement of the teeth on the cylinder, as represented in the engraving, is spiral; but the inventor proposes, if upon trial it shall be found expedient, to place them in rows lengthwise of the cylinder; he also proposes to add to his machine the ball and chain percussive force, having it attached to the cylinder at the back of each tooth.

WILLIAM A. COX, *Chairman.*

Mechanics' Institute, New-York, February 18th, 1840.

GENERAL SOCIETY OF MECHANICS AND TRADESMEN.

We are always glad to obtain any thing, whether of reports or of statistics, relating to an institution so every way useful, and so extensive in benevolence, as this society has long been. But although enlarged be the sphere of its operations, it is quiet and unobtrusive in the conduct of them, and contrives to do much work with little noise.

The annual report of the Almoners, however, is one among the few documents which necessarily attain a measure of pub-

licity, and from this we take leave to make the following abstract.

It appears by this report, that there are now upon the pension list of the Society—

84 Widows, with an aggregate of 60 children.

3 Pensioners, who are members of the society.

1 Family of Orphans.

88 Pensioners.

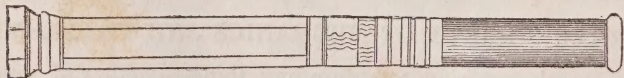
To these, there has been paid, during the year 1839, the sum of \$2,577 $\frac{25}{100}$.

The report, further states, that the total amount paid to pensioners during the five years preceding, viz: from 1834 to 1839 is \$13,500; and that the sum of \$2,700 has been appropriated for the use of this department for the present year.

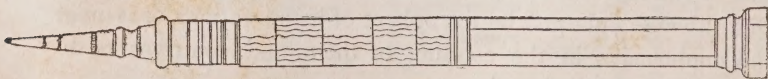
Now this munificent expenditure is only on account of one item in the plan of this institution. There still remain the reports concerning the library, the school, the lectures, and other benefits which attach to members of the society, their widows and children, and which must bring conviction to every individual that to be identified with such an institution is to receive a benefit rather than to make a sacrifice.

We must be contented from want of present space, to defer our attention to the other parts of the report until the next number of our journal.

Report of the Committee on Arts and Sciences of the Mechanics' Institute, on JOHN HAGUE'S Ever-pointed Pencil Case.



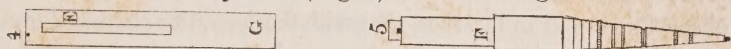
This beautiful article is constructed so as to be less liable to accident, and therefore, more durable than the pencil cases in



general use. The same quantity of metal could not have been arranged in any other form with a stability equal to this. Hav-

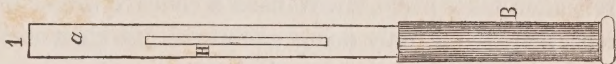
ing no slot, except in the under cylinder, the strength is not diminished in this case, as in those of ordinary use. The slide cannot collect dirt, nor cut out the pocket; and, when the point is protruded, it cannot possibly slide back from pressure thereon, whilst writing. The following description extracted from Mr. Hague's patent will clearly show its construction.

I take an ordinary tube (Fig. 5) for containing the lead in use,



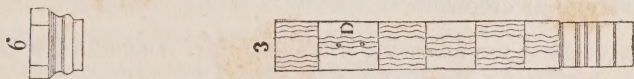
differing only from those generally employed in doing away with the screw at the upper end, sliding tube Fig. 4 over Fig. 5 until G covers F; the slit E, Fig. 4, is intended to act as a spring, and cause it to run smoothly. Figs. 4 and 5 are soldered together at G. F.

Fig. 1 is a plain cylinder, having a slit H, wherein the pin slides, in order to



protrude the point; in its upper end is a receptacle for the spare leads; a small cylindrical tube is placed over Fig. 1, seen at B, and soldered to it; the end B of Fig. 1 is then passed over the end E of Fig. 4.

Fig. 3 is passed over Fig. 1, covering B, and pinned to Fig. 4,



as seen at D, (Fig. 3) through H, Fig. 5. Fig. 2 is an octagon cylinder, to the upper end of which I solder a screw to admit the top or head, Fig. 6. This tube is then placed over the upper end of Fig. 1 and of Fig. 3, and soldered to the upper end of Fig. 1.

By pushing the middle tube (Fig. 3) downwards, the pencil point is protruded and ready for use.

WILLIAM A. COX, *Chairman.*

MR. A. S. WOLCOTT'S IMPROVEMENTS ON THE DAGUERREOTYPE.

In our last number we gave a full account of the Daguerreotype, as described by the inventor, with some observations re-

lative to improvements thereon; since this, Mr. Wolcott has completely revolutionized the process, and produced results heretofore unattainable.

The inventor could not succeed in taking likenesses from the life, and indeed very few objects could be minutely represented, unless positively white, and in broad sunlight. Mr. W. commenced his experiments in October last, and one of his earliest observations led to the fact, that with the lens, the chemical and visual foci were not equidistant, and therefore to obtain a perfect impression, it would be necessary to bring both foci to the same point, so that at the point where the most perfect image was obtained, the greatest strength of chemical action would take place. As all rays reflected, whether of light, heat, or chemical action, are at right angles from the plane from which the reflection takes place, Mr. W. used a concave mirror instead of a lens, thereby not only doing away with the chief difficulty, but producing the result in a much shorter time.

We have seen a number of miniatures taken from the life with this instrument, which are most striking resemblances of the originals. We cannot leave this subject without recording our humble opinion that Mr. W.'s improvement does him and his country infinite credit.

We received the following letter from Mr. Wolcott a few days since, which will fully explain his method.

DEAR SIR:

New-York, March 13th, 1840.

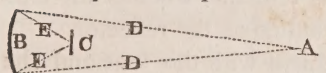
When the announcement was first made of M. Daguerre's method of imprinting the beautiful images of the camera on silver plates, the remark was very generally made, that taking likenesses from life would be one of the most important uses to which it could be applied.

On reflection it appears that on account of the difficulty of a person's remaining perfectly still for any great length of time without the appearance of constraint, or without changing the expression of the face, the great desideratum was to construct a camera that should condense the greatest quantity of light to form the image, that was consistent with distinctness. Not having an achromatic glass in my possession larger than the ob-

ject glass of a microscope, I proceeded to experiment with a single concave reflector, as the most simple of all optical instruments, and as the one which, if of large dimensions and truly elliptical, would most probably best answer the above ends of distinctness and brilliancy combined.

My first experiment was I think in October, with a reflector of $1\frac{1}{4}$ inches aperture and 2 inches focus. With this I took the profile of a person standing opposite a window; and here having but the three principal facts relating to M. Daguerre's process, viz: the exposing the plates to vapor of iodine, afterwards to that of mercury, and the washing in hyposulphite of soda, or in common salt, I fell into the same error as probably many others, which was, that I supposed it necessary to keep the plate in the camera until the image was visible. This error prevented my making a larger instrument immediately; that which I now use is 7 inches clear aperture, and is used in the following manner.

The person is placed at A, and in the axis of the reflector B.



C is the plate on which the image is to be formed. D D are rays radiated from the person, and falling on the mirror B. E E are the same rays converging to a focus after reflector C is inclosed in a box to exclude the extraneous light.

From experiments which I have made, I find that a speculum, of 7 inches aperture and 12 inches focus, will form a picture in about the same time as a single lens, of $3\frac{2}{3}$ inches aperture and 12 inches focus. Taking this as a standard of comparison, we may make an estimate of the action of lenses and reflectors.

In consequence of a lens inverting the image of an object, it will be necessary to use a flat speculum, in order to cross the rays; and to reduce the aberrations, the lens should be a compound one, consisting of at least 3 glasses. If we estimate the rays lost by reflection from each surface as $\frac{1}{12}$ and the rays

transmitted by a single lens, as	-	-	-	-	100.00
we have, Loss by 1st surface of 2d glass	-	-	-	-	8.33
					91.67
Loss by 2d surface of 2d glass	-	-	-	-	7.63
					84.04

			84.04
Loss by 1st surface of 3d glass	-	-	7.00
			<u>77.04</u>
Loss by 2d surface of 3d glass	-	-	6.42
			<u>70.62</u>
Loss by flat speculum, $\frac{3}{8}$	-	-	26.48
Rays transmitted after one reflection, and re- fraction through three lenses, as compared with that transmitted through one lens of the same aperture	-	-	44.14

Now as 44 : 100 so is 100 : 227; that is, if the area of the single lens is 100, that of the triple lens must be 227; and taking the square roots of the numbers for the apertures, we have $\sqrt{100} : \sqrt{227}$, so is 3.66, the aperture of the single lens, to 5.49, that of the compound one.

With a lens, we are under the disagreeable necessity of placing it about $\frac{1}{40}$ of its focal distance nearer the plate than the luminous focus, which may prevent that nice adjustment which is so desirable; besides, the question remains, whether the lens can be made to form as distinct an outline as the reflector.

If I have not erred in my experiment with the lens and the reflector, it would appear that the chemical and luminous rays do not follow the same laws with respect to reflection and refraction. Thus it is estimated that there is a loss of about $\frac{1}{2}$ the light from a speculum by reflection when the rays fall nearly perpendicular to the surface.

Call the rays falling on the speculum	-	100
Loss one half	-	50
		<u>50</u>
Loss, $\frac{1}{6}$ by the plate being interposed	-	8
		<u>42</u>
Light falling on a lens,	-	100
Loss by reflection from 2 surfaces,	-	16
		<u>84</u>

Thus we have, after reflection, 42 parts, and after refraction 84 parts; that is, half the area with the glass would be just as effectual with light as the whole would with a reflector; this would give 5 inches as the diameter of the glass, and 7 inches

that of the reflector, whereas by my experiment $3\frac{2}{3}$ is the diameter of the glass when it is equally efficacious with the chemical rays as the reflector of 7 inches. This would give nearly twice as great a loss of the chemical rays, by reflection, when compared with refraction, as there is of the luminous rays.

If there is this difference between reflectors and refractors there should be a much greater allowance than $\frac{3}{8}$ for the loss from reflection from the flat speculum used with the lens. This would bring the aperture of the glass about equal to that of the reflector.

I shall repeat the experiment more carefully when I have time, and if I am in error, will give you the result.

Yours, respectfully,

JAMES J. MAPES, ESQ.

A. S. WOLCOTT.

Report of the Committee on Arts and Sciences of the Mechanics' Institute, upon EDWARD CLARK'S Process of Manufacturing White Lead, (Carbonate of Lead.)

The committee beg leave to report, that they have carefully examined Mr. Clark's process, and find it to embrace all the known chemical requisites for the manufacture of white lead, united to an improved mechanical arrangement, which produces an excellent pigment, with a more certain and economical result than has been obtained by any former plan.

The committee would state for the information of members, that carbonate of lead is composed of metallic lead combined with oxygen and carbonic acid gases, in definite proportions; that in order to induce this combination, it is necessary first to cause a due proportion of oxygen to combine with the lead, forming protoxide of lead, (the litharge of commerce) and further to induce the combination of the carbonic acid with the litharge to form white lead. Experience has shown that this latter combination is most easily produced by the help of a chemical agent (acetic acid) contained in common vinegar. Premising thus much the committee proceed to the

Description. A, A, are wooden cases filled with rods on which are suspended sheets of lead, as represented in Fig. 2.

B, blowing cylinder, communicating with the furnace D, and intended, by means of the pipes H, to supply the cases A, A, with carbonic acid gas, generated in the furnace by the combustion of charcoal, and atmospheric air, (received through an opening in the pipe,) by which a supply of oxygen is obtained.

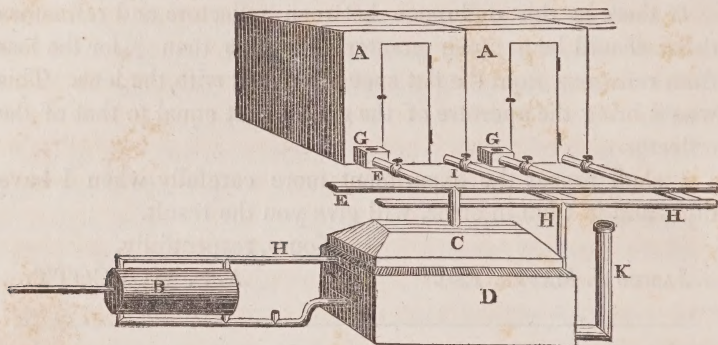


Fig. 1.

The pipes H pass into covered troughs pierced with small holes, as in Fig. 2, to distribute the gases throughout the case.

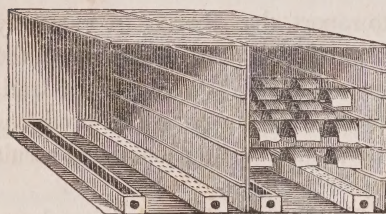


Fig. 2.

C is a steam boiler communicating with pipes E, which pass through the vinegar troughs C, and serve to heat the vinegar, that its vapor may be received upon the sheets of lead suspended on the rods.

From this it will be seen that when the blower is put in operation, and the troughs supplied with vinegar, a proper adjustment of the cocks in H and E, will permit any required quantity of atmospheric air, carbonic acid, or vapor of acetic acid, to be brought in contact with the metallic lead. If it be necessary to watch the progress of the operation, it may be done through an opening so small that it will suffer but very little of the carbonate of lead to be thrown into the air. The time required to corrode a case of metallic lead, varies from two to four weeks, according to the influence of accidental causes.

The committee would conceive they performed but a part of

their duty to the institute, should they omit to enumerate the principal modes heretofore used to obtain white lead, and state their disadvantages.

The most common method is to place the lead in pots and embed these in horse litter, or other inhumating material. The decomposition of this furnishes the gases necessary to corrode the lead.

This process requires from two to four months, and the pigment is often discolored by sulphuretted hydrogen gas.

The process of Lescure and Brechez, or Clichy process, as it is usually called, forms a pigment very inferior in body to most of those formed by other modes.

The German process, although it forms a pigment of great beauty, is nevertheless from its expensiveness, almost impracticable. But few attempts are now made to manufacture white lead upon this plan.

It is not the least important feature of Mr. Clark's method, that by his economical arrangement, the risk to the workmen is very considerably diminished and the ever baneful effects of white lead rendered a much less source of dread to the operatives.

All of which is respectfully submitted.

WILLIAM A. COX, *Chairman.*

[For the American Repertory.]

LECTURE BY PROF. T. S. CUMMINGS,

On the application of Fine Arts to the Mechanic Arts. Delivered before the Mechanics' Institute.

In a country like ours, as yet on the threshold of her greatness, it is of the utmost importance that such a direction be given to her energies as shall leave no step to be retraced; with this fact before us, we cannot in justice to the mechanical interest leave the subject of the application of the Fine Arts to the Mechanic Arts in its present obscure and lethargic state.

We believe there is no agent more powerful than the arts of design, judiciously directed, for advancing both the intellectual and pecuniary interests of the artisan; their power to produce

the results we have alluded to, we believe to be beyond dispute.

By the influence of the arts of design, science is rendered more clear, more instructive : forms are preserved that *words* would be incompetent to express. By their assistance the discoveries of the studious mechanic are preserved and disseminated. By diagrams, the most complicated piece of machinery is rendered simple, and easy to be understood by the artisan, even when the discovery may be described in a foreign tongue. By their aid, plans are rendered more sure and comprehensive, even during their progress, or that of the work, and may be transmitted to others for their guidance. Their influence in rendering the daily duties of life agreeable to us, is stronger than we are aware of.

It is well known that the success of many mechanical products depends upon the taste of arrangement displayed by the projector ; and, be this taste what it may, without some knowledge of the arts of design, it is not available, and many a mechanic possessing exquisite taste, is not aware of his superiority, simply for the want of some means to register his embryo thoughts, until the entire developement of his design. No stronger illustration of this fact can be asked for, than the classic style of ornaments used by French artisans ; with them the arts of design compose part of their common school education.

We give above a few particulars of Professor Cummings' lecture, and regret that our space will not permit its publication entire. We have long been impressed with the necessity of educating the young mechanic in the arts of design ; which will not only enable him to pursue his business with greater certainty of success, but with a much smaller amount of capital. We will example cabinet makers, many of whom, for want of means have but a small stock of manufactured goods on hand, and their friends, after examining their stock, (being unable to describe precisely what they want, or perhaps waiting for a direction to be given to their taste by seeing handsome forms) and finding nothing to suit them, go to the larger warehouses to

make their selections. Now, it is self-evident, that with a large assortment of drawings in perspective, the order could have been secured, and a working drawing made for the workman, which would save a large portion of the time of the principal in giving directions. Thus, a port-folio answers all the purposes of a large capital, a warehouse, and part of the valuable time of a superintendent of the work.

Why should not the supports of printing presses, steam engines and all other machinery, partake of the same beauty of form as those of French lamps, or inkstands? Why should not the iron supports of a door way represent a Hercules, or any other classic form, rather than the straight hard-lined slab, or straight column? the casting is no more expensive in such forms than those ordinarily in use, and the first cost of the model would be doubly paid for, by the increase of business. In cases where the use of such ornaments are objectionable, apply the strict laws of architecture, and do not greet a friend on his entrance to your house, with a door-way more resembling a gallows than the hospitable porch of a friendly mansion. The Professor instanced WEDGEWOOD, from whose factory England has received many of her first artists, and the beautiful forms emanating from his genius will long stand as monuments of his fine classic taste.

From Wedgewood's knowledge of the arts of design, he proved a competitor to the entire talents of the world, and his wares are at this day cherished as fine specimens of art. He called in the assistance of the immortal Flaxman, and thus, the first sculptor of the age was engaged ornamenting the porcelain, from which the peasant received his hard earned meal, which, despite the doctrines of Diogenes, undoubtedly gave him well deserved pleasure.

ED.

COPIES OF MEDALS AND ENGRAVINGS BY GALVANISM.

Our readers will doubtless recollect an account of the above discovery claimed by Prof. Jacobi of St. Petersburg, and Mr. Spencer of England, by which these gentlemen have been enabled, through the assistance of a very simple galvanic appa-

ratus, to precipitate copper from its solution as a sulphate, in metallic form, on the surface of medals, so as to make a perfect cast or impression. Several scientific gentlemen in this city have successfully repeated the experiments, and specimens may be seen at the Mechanics' Institute, by those who wish to witness the result.

Report of the Committee on Arts and Sciences, of the Mechanics' Institute, on the Metallic and India Rubber Boot Heel, invented by SAMUEL WARNER, JERE HODGKINS, and WILLIAM E. TRAVER.

The outer case is formed of thin metal, open at the bottom with a rim or flange on the inside, near the sole by which it is attached to the sole with eight screws. It is then filled with cork as far as the dotted line, and a piece of india rubber cut to fit is fastened to the cork by liquid caoutchouc paste. The india rubber protrudes below the metal case from a sixteenth to an eighth of an inch. This arrangement is less expensive than the ordinary leather heel, will probably not wear unequally, and thus the soles will be more durable. From its elasticity, it is noiseless, and produces less jar on the body; can be cheaply renewed by new india rubber, and used for a second pair of boots if desired. The only objection observed by the committee is its liability to become slippery in wet or muddy weather, and to become soft when held to the fire to dry. The inventors propose as a remedy for these faults, to cap the outer surface of the india rubber with leather, which would not do away with any of its advantages.

WILLIAM A. COX, *Chairman.*

NOTICE.

Burnet's Hints on Composition. This invaluable work, for the use of artists, has lately been republished by Messrs. LINEN & FENNEL, No. 229 Broadway. The English edition is sold at \$8, and its exact counterpart can now be procured for \$3. There is no work more valuable for the aspirant in the arts. All the difficulties of composition are reduced to system, and their remedies pointed out; the illustrations (which are numerous) can

be readily understood, and consequently appreciated. We understand Messrs. L. & F. will soon republish Burnet's hints on color, also, on light and shade, forming the entire of his work on painting; the cost of the whole will be \$9, instead of \$24, as now charged for the English edition, which is in no way superior to the specimen before us.

STEAM AND ITS APPLICATIONS.

Important. Steam Engine Boiler.—An article on the cause and prevention of adhesion of certain substances contained in the water, supplied to the boilers of steam engines, for the purpose of generating the steam, having recently appeared in the *Leeds Mercury*, the following information communicated to us by a correspondent, although a simple detail of facts (which in matters of practical utility are of more value than theories) will, we think, not be altogether uninteresting to those of our readers connected with mill property. There is at present in use a steam engine boiler attached to a steam engine of twenty horse power, the property of Mr. Ellison of Birkinshaw, which has been in regular use upwards of twenty-five years, and from a recent examination by competent persons, pronounced to be in such a state of perfect soundness as to warrant the opinion that it will yet endure many years. The water supplied to the boiler is a mixture of spring and surface water, and formerly a considerable adhesion to the inner coat of the boiler used to take place, which rendered it necessary to use a hammer and chisel to clear it away, at the time of cleansing the boiler. About eight years ago, the engine tender, after cleaning out the boiler, put in four stone of *potatoes*, which practice he has continued up to the present time at regular intervals of six weeks' duration, at which time the boiler is always thoroughly cleansed out, which, since he commenced the above stated practice, required very little trouble to do, as instead of having to hammer away as heretofore, the only implement which is now necessary to use, is a broom, for the purpose of clearing away a slight deposit of mud at the bottom of the boiler, there being no adhesion whatever. As an act of justice to all parties, we ought to state that the plates of which the boiler is made were furnished by the Bowling Company, and are *double the thickness* of those now in general use, and the boiler was put together on the premises where it is now at work, by a young man of the name of Robinson, then residing at Gildersome, but we understand now a clever mechanic at Leeds. On recently observing to Watson, the late working engineer to the Bowling Company, the long duration of this boiler in comparison to those of modern make, he replied—Yes, people now-a-days will have cheap boilers, and in order to furnish them to their liking, they must be made light; and he went on to state that an eminent spinning firm in Bradford had recently burnt out *two* boilers in as many years. Bradford Observer.

Potatoes have long been used on our fresh water rivers for this purpose, and sometimes with good effect. The floor scra-

pings of potash warehouses are also used, with the same, or greater advantages.

STEAM VESSELS ON THE ATLANTIC IN 1841.

Names.	Tons.	Horse Power.	Length.	Ports.
Great Western - -	1,340	459	236	Bristol to New-York.
British Queen - -	1,870	500	276	London do.
Liverpool - -	1,150	468	223	} Liverpool do.
New York - -	2,000	600	200	
United Kingdom -	2,000	600	..	London do.
President - -	2,500	600	..	Liverpool do.
City of N. Y. (iron)	2,500	700	..	Bristol do.
S'mer. Cunard's....	1,100	420	..	} London to Boston.
Do. do.....	1,100	420	..	
Do. do.....	1,100	420	..	
Do. do.....	1,100	420	..	
Do. British Gov't	1,000	300	..	} Glasgow do.
Do. do.....	1,000	300	..	
Do. do.....	1,400	400	..	} Falmouth or Southampton to the W. Indies, Gulf of Mexico, S. America, and the Brazils; also from Havana to New-York, keeping the entire West India and American route open.
Do. do.....	1,400	400	..	
Do. do.....	1,400	400	..	
Do. do.....	1,400	400	..	
Do. do.....	1,400	400	..	
Do. do.....	1,400	400	..	
Do. do.....	1,400	400	..	
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Do. do.....	1,400	400	..	
Do. do.....	1,400	400	..	
Do. do.....	1,500	500	..	
Do. do.....	1,500	500	..	
Do. do.....	1,500	500	..	
Do. do.....	1,500	500	..	
Do. French Gov't	1,200	400	..	} Havre to New-York.
Do. do.....	1,200	400	..	
Do. do.....	1,200	400	..	
Do. do.....	1,200	400	..	
Do. do.....	1,100	400	..	} Brest to Brazil.
Do. do.....	1,100	350	..	
Do. do.....	1,100	350	..	} Bordeaux to Vera Cruz.
Do. do.....	1,100	350	..	

Historical statement of duty performed by Steam Engines of Cornwall.—Since the period at which Savary first published his “*Miner’s Friend*,” the rich mines of Cornwall have formed the scene of an interesting series of experiments; interesting, whether we consider the magnitude of the scale of individual experiments, or the extent of their influence on the national prosperity, as well as the fertility of their results in illustrations of scientific truth. It was here that Savary discovered the most ample field for the introduction of his “new invented fire engine;” it was here that, in conjunction with Newcomen and Cauley, he most extensively applied that power to draining water from mines; it was here that Smeaton raised his gigantic monuments of shrewd mechanical instinct and elaborate scientific contrivance; and it was here that Watt first placed his thousands of untiring teams of iron horses. Here, too, have of late years been introduced into daily practice all the mechanical improvements which the investigations of the theories of heat, pneumatics, and mechanics, have suggested to the minds of learned men. Yet it is wonderful how slight is the effect which the experiments of this remote county have produced on the practice of the other parts of the mechanical world, and especially of Great Britain. While the world teems with idle projects of ridiculous “improvements,” of rotary and semi-rotary, of revolving and semi-revolving, conical, discal, and polygonal engines; with smoke-burners and savealls of innumerable orders; and while every one of these finds its devotee and its dupe, it is truly wonderful and most melancholy, that the simple, but very important practical truths, provisions, and maxims, so well known, and so ably practised, by the Cornish steam engineers, have made their way so slowly among their fellow countrymen; truths, whereby power is obtained and economized, and fuel saved to a greater extent, in every day’s practical experience, than had been imagined possible, even by the most wild and ignorant schemer. Yet these great results have been obtained by the Cornish engineers, not from any complex or intricate mechanism, not from any patent or secret process, not from any great discovery or invention, but from the quiet and unpretending application of the best known and most common place truths to the common steam engine. We have long lamented the apathy of English engineers generally to the Cornish improvements; and have looked forward with much anxiety to the appearance of the present important work, as one likely to exercise an extensive and highly beneficial influence on general engineering practice. It has been put forth at the request of the British Association for the advancement of science, and partly, we believe, at their expense, and was originally proposed, if we rightly remember, by Mr. John Taylor, the treasurer, a gentleman to whom we are indebted for much of what we formerly knew concerning the facts of the Cornish engines. It has been drawn up by two practical men, of all others the best fitted to do justice to the subject, Mr. Thomas Lean and his brother, the authors of the Monthly Official Reports of the Duty of the Cornish Steam Engines. The vast difference between the common system of working steam engines and the Cornish system may be appreciated by the following statement: that five times as much work has been done by a Cornish steam engine as by an excellent Boulton and Watts engine on

the common system; or, that the same amount of work is done with one fifth part of the expense of fuel! a statement almost incredible yet perfectly true. The amount of work done by a steam engine is called by engineers its "duty," a phrase which is thus defined by a former president of the Royal Society, Davies Gilbert, now the father of British science:

"The criterion of the efficiency of ordinary machines is, force multiplied by the space through which it acts; the effect which they produced measured in the same way, has been denominated duty, a term first introduced by Mr. Watt, in ascertaining the comparative merit of steam engines, when he assumed one pound raised one foot high for 'the dynamic unit.'"

Now, by this criterion, it has been found that, whereas one bushel of coals, in one of Boulton and Watt's engines, wrought in the common way, raised 20,000,000 of pounds one foot high, an engine on the Cornish system now raised, with each bushel of coals, 125,000,000 of pounds to the same height. The results of such improvements may be easily conceived; the economy of steam has preserved in operation extensive and valuable works, which would otherwise have been swamped with debt and water. An instance of this, quoted by Mr. Lean, is as follows: "these improvements saved the mine. At that time they were burthened with a debt of many thousand pounds, which was continually augmenting; but as they now consumed less than half the previous quantity of coal, and at the same time kept the mine effectually drained, so that the miners could work without hindrance, they not only discharged the debt, but obtained considerable profit."

The saving of coal amounts, in the county of Cornwall, to £80,000 sterling per annum. The means by which all this has been accomplished in Cornwall, and may be accomplished elsewhere, are the following:

1. By working the steam expansively to a degree unheard of elsewhere. This system was first introduced, in its fullest extent, in 1814, by Woolf, and the duty immediately rose from twenty to fifty millions of pounds.

2. By the introduction of a system of conservation of heat, both in the boiler and cylinder; this was effected principally by Capt. Samuel Grose, and consisted in surrounding the boilers and cylinders by non-conducting substances; whereas, formerly they had been exposed to the rapid abstraction of heat by the atmosphere: in 1827, the duty from this cause rose to sixty-seven millions of pounds; in 1828, the enormous duty of eighty seven millions of pounds was obtained; in 1832, so much as ninety-one millions of pounds of water was raised one foot by a bushel of coals; and in 1835, the careful application of the conservation of heat, and the expansion of the steam, raised the duty of Austen's engine to 125 millions. Such are the results which a diligent and careful application of elementary and scientific principles, by practical men, to the subjects of their professional duties, has achieved. We trust it may prove an example to all practical engineers. We know nothing that would so much conduce to bring about similar improvements in all the branches of steam application, as the adoption

of a system of printed returns of the duty of land and marine steam engines all over the kingdom. Of the advantages to be derived from such a system, every one may be convinced who will take the trouble to examine this unpretending collection of valuable facts. Athenæum.

Prevention of Smoke, &c.—After an accidental visit to the Castle Mills, near this city, in September, 1838, we returned much impressed with the importance, in a national point of view, of Mr. Ivison's invention for the consumption of smoke, which we had there seen in operation. Under the influence of that impression, we published a few remarks on the subject with the view of attracting to it general notice. The matter was then entirely new to us, as it was probably to most of our readers, and we could only bear witness to what we had seen effected under the direction of the inventor on his own proper territory, so to speak, waiting patiently for its more general application, and for additional experience, to be gained from other quarters. We have lately made further inquiry into the working of "Ivison's Patent for the Prevention of Smoke and Economy of Fuel," such being the title it bears, and we find that it has been applied with full success to a variety of engines of all sizes, from 72 to 5 horse power, and with every variety of pressure, from $3\frac{1}{2}$ to 30 lbs. on the inch. A list of a great many places in the neighborhood and elsewhere, where it has been applied, has been shown to us, with corresponding certificates, all bearing that the prevention of smoke has been complete, and the steam well kept up. We have also seen certificates from three separate engineers, testifying to the fact, that after many months use of the patent, the boiler at the Castle Mills is not injured in the slightest degree. In those cases in which the quantity of fuel could be correctly ascertained and contrasted with the prior workings, there has been a saving, varying from 12 to 16 and 20 per cent. and upwards. In no case has there been any waste of fuel.

With this evidence before us, confirmed by what we have seen on a *second* visit to the Castle Mills, we have this week had the patent applied to the furnace for our steam engine. Our experience, therefore, of its efficacy upon our own premises is necessarily very brief, but so far as we have gone it is satisfactory. The short time we work our engine, at weekly intervals, renders the saving power in fuel of no great importance, and on that head we can say nothing at present in our own case, but we consider ourselves justified in stating, even now, that the greater evil with us, smoke, will not trouble us or our neighbors more; if, indeed, it has ever troubled them, of which we have had no complaints, our operations being carried on for the most part in the night.

The Proprietors of the patent say that the quantity of steam used in the furnaces does not exceed one per cent. of the whole quantity generated; that the whole apparatus has frequently been fitted up and applied to a boiler in $3\frac{1}{2}$ or four hours; that the expense is very trifling; and, that after a few hours' work, any fireman or stoker is quite able to manage it. They admit that such large savings as the following table exhibits may not be realized in works already erected, which require alteration, in the chimneys especially; but in several which have recently been constructed with chimneys only 25 and 30 feet high, instead of 60 or 70, the results have been extremely satisfactory.

They also state, that when the Police Commissioners of this city turned their attention to the prevention of smoke from furnaces, they properly took care to guard consumers from any great charge that might have arisen in consequence of their proceedings, by arranging with the Patentees, at a meeting of their committee with a number of the consumers, that the charge for licenses for this patent in Edinburgh and its vicinity should be only 20s. purchase for each horse power of engines, or corresponding quantity of fuel consumed for other purposes, and that the Patentees readily agreed to these terms, with a view to the prevention of smoke alone, independent of any question with respect to the saving of fuel, although they are quite aware that consumers will benefit largely in this respect.

They further state, that the patent is applicable to a great variety of other purposes, besides the furnaces of steam engines, and see no reason why the smoke of gas works, breweries, distilleries, dye works, paper works, bleachfields, &c. &c. may not be very much diminished, if not altogether prevented.

J. & J. GRAY.

Edinburgh, Oct. 26, 1839.

The following table shows the result of the operation at the original works.

EXPERIMENTS.	lbs. water to 1 lb. of Scotch coal.	lbs. water to 1 lb. of Eng. coal.	lbs. English coal to cubic foot water, or horse power per hour.
<i>Former Methods:</i>			
Watt's average, - - -	5.55	7.4	8.4
United Mines Loam, (Ed. Phil. Jour. July, 1839.) - - -	6.9	9.58	6.23
Parke of Warwick's method, - - -	7.72	10.32	6.03
Huel Towan, (Ed. Phil. Jour. July, 1839.) - - - -	7.91	10.55	5.9
Mr. Henwood's former experiment, - - - - -	8.9	11.57	5.32
<i>Ivison's :</i>			
Average of eight experiments, certified April 13, 1839, - - -	11.41	15.21	4.09
Average of two experiments, certified May 10, 1839, - - -	13.94	18.58	3.35
Average of twelve workings, certified July, 1839, - - -	13.25	17.66	3.52
Maximum result of do. - - -	14.72	19.62	3.12
Average of the four preceding lines, - - - -	13.13	17.96	3.46

A plan for consuming smoke from bituminous coal and wood has been in use many years, both in England and in this country. The fire bars are hollow, and all join in a main, both in front and rear; the rear main communicates with the bridge wall, which is hollow, having egress for the air at its top. When air, is admitted into the front main it passes through the hollow bars, becomes heated, and in this state comes in contact with the smoke at the top of the bridge wall, thereby

supplying sufficient oxygen for its combustion. When the air hole in the front main is shut, smoke will issue from the chimney as usual; but the instant it is opened the smoke ceases to show itself, being consumed in the flue.

The Steam Whistle.—The following recommendation, with a view to prevent those accidents frequently occurring in consequence of the collision of steam vessels, is given in the report made by Parliamentary Commissioners appointed to investigate this and other subjects, and is worthy attention at this season, when river navigation is so frequently impeded by fogs :

“A distinguishing sound should be provided on board steam vessels as an alarm, to notice their proximity to other vessels at night, on the occasions, but more particularly during foggy or thick weather, when lights can only be seen on a very near approach. The want of such regulation is alluded to by several of our correspondents, and a means is also suggested for accomplishing the end. Sailing vessels are generally provided with some instrument for making a noise, to which resort is had when circumstances require it, viz. bells, horns, gongs, &c. A steam vessel carries with it an agent more powerful than any of these contrivances, and one which could not fail in notifying its approach, distinctly from every other class of vessels, and from a much greater distance than bells, &c.; a circumstance of no slight consequence, when the greater velocity of a steamer is considered. The steam whistle in common use attached to locomotive engines, if applied to the boiler of a steam vessel, would completely fulfil the desired end. All that is required is a small pipe opening into the steam chest, and brought on deck, with the whistle on the top of it, in a convenient position to be used when the commander may order it. By simply turning the handle of a cock, a prolonged sound is produced, or a succession of sounds, on opening and shutting the cock at short intervals. The sound from the whistle of a locomotive engine has frequently been heard more than two miles.

Perthshire Courier.

MISCELLANEOUS.

Berzelius.—When Berzelius returned, he received us with great cordiality. We were much struck with his appearance—judging by the appearance of some of the German *savans*, we had expected to find him an out of the way kind of being; but he is totally devoid of affectation either in dress or manner. Men of eminence in Germany startle the stranger in quite a different way; they may look like men of genius, but would seldom be mistaken for men of sense. Their pale faces, long ‘unkempt’ locks, and antiquated garments, afford the most complete contrast to the healthy looks and unaffected bearing of this Swedish rival. In fact, from his dress, ease of manner, and total want of pretension, he might pass, in any society in Europe, not for Berzelius, the great chemist, but Berzelius, the well-bred gentleman. In place

of Dr. Faustus' garments, he sports a smart carriage cap, silk vest, and blue coat, very like that of ordinary mortals. He is a well made, good looking man of the middle size, rather stout than otherwise, but with nothing in his appearance to make us suspect that he had gout, and that he found it necessary to drink chalybeate water. In a visit to Paris, the preceding summer, they had tried to kill him with kindness, but judging by his looks, we should say, he will survive many such assaults. He travels much, and proposed an early visit to Copenhagen. If his manner be unaffected, his conversation is equally so: it has nothing of *the shop* about it. Not that he shunned—for that in him would have been affectation of the worst kind—all allusion to his own science. Part of the conversation (which was carried on chiefly in English, with the aid of an occasional theft from German) turned on *our* eminent scientific men; and nothing could have been more becoming than the liberality with which he praised these his worthy fellow laborers. Faraday, Buckland, Sedgwick, Jameson, all came in for the deserved meed of approbation; but the Wernerians, of course, did not escape without a gentle pat. When he remarked that their warm attachment to the principles of their school was in a great measure, attributable to their affection for its head, whom his pupils worshipped as a kind of deity, and, therefore, regarded every departure from his lessons as sacrilege—it struck us that the same may soon be said of himself, and of his school. His pupils revere him with boundless affection; but they must expect in their turn, to be termed “antiquated.”

Bremner.

Mr. Leslie's Coronation Picture.—We have been favoured with a view of Mr. Leslie's Coronation Picture, which is now privately exhibited at the rooms of Mr. Moon, in Threadneedle Street. Upon this picture, painted by command of her Majesty, Mr. Leslie would appear to have exhausted the whole of the resources of his genius. It is in every respect a most exquisite production. We have no other way of conveying an idea of its extraordinary merit, than by pronouncing it one of the best, perhaps the very best effort of Mr. Leslie's pencil. It is alike admirable in the artistical qualities of composition and colour, and in the striking accuracy of the likenesses portrayed in every group. Designed with equal taste and skill, it is finished with the most elaborate care, and presents to the eye a picture at once rich, but chaste—animated, but calm. The point of action selected from the solemn ceremonial of the day, to form the subject of the picture is well and happily chosen. It is where the Queen, having been crowned, repairs to the altar to receive the Holy Sacrament. This, which in the living scene was more deeply impressive than any other part of the ceremony, has lost none of its interest, none of its impressiveness, in the hands of the painter. Her Majesty, divested of her Crown and of all the emblems of Royalty, with the exception of the Dalmatic robe, is represented kneeling at the altar, and about to receive the cup from the hands of the Venerable Archbishop.

Nothing can exceed the gracefulness and truth with which the features and figure of her Majesty are drawn. There is no effort, no straining after effect. In the lovely form before us, we see not the crowned and jewelled Princess, but the gentle girl, earnestly but humbly communicating with Him, in whose hands is the fate of kings. A more

beautiful portrayal of royalty subdued, and tempered by communion with a Superior Being, never gratified the eye, or awakened the sympathy of the heart. The reverent attitude, the deeply attentive countenance, the all-pervading gentleness of expression, invest the person of the Sovereign with a charm of which no words can convey an adequate impression, and which till now, the pencil has never so happily traced. Mr. Leslie has succeeded in giving us the most accurate, and, therefore, the most pleasing, likeness of her Majesty that has yet appeared. But the merits of the picture are by no means confined to the portrait of the Queen. Equal care has been extended to every part of it; and the skill of the accomplished artist was never more strikingly manifested than in the apparent facility with which he has overcome all the difficulties of his subject, breaking the straight lines of human figures, and throwing them into pleasing groups, without interfering with the general harmony of composition, and subduing the glare and gaudiness of the gold and crimson robes which hang on each man's shoulder, without impairing their richness, or diminishing their effect. Equally happy has he been in the likenesses of the many distinguished persons who were assembled near the Queen during this solemn part of the ceremony. On the left of the picture, by the side of the communion table, are the Duke of Norfolk, Lord Willoughby d'Eresby, the Marquis of Conyngham, and the Bishop of London. Nearer to the person of her Majesty, are Lord Melbourne and the Duke of Wellington. Immediately behind her is the Duchess of Sutherland, and that matchless train of beauty composed of the fair members of noble houses who performed the office of Ladies in Waiting. Amongst these are the Ladies Barham, Caroline Lennox, Adelaide Paget, Fanny Cowper, W. Stanhope, and Mary Grimstone. This group alone would make the picture a thing to be sighed for by all men. In the galleries, which form the background, are the Duchess of Kent, the Princess Augusta, the Princess Augusta of Cambridge, and the Princess Hohenlohe. Near the Duchess of Kent is the ill-fated Lady Flora Hastings, and further to the right are the Ladies Caroline Campbell and Caroline Legge, the Hon. Miss Kerr, and Lady Mary Pelham; Lord Villiers, Lord in Waiting; Lord Morpeth, Lord in Waiting on the Duchess of Kent; the Duke of Nemours, the Duke of Saxe Coburg, and Prince George of Cambridge. On the extreme right are their Royal Highnesses the Dukes of Sussex and Cambridge. The masterly grouping of this mass of figures, and the fidelity of every one of the portraits, are beyond all praise. Mr. Moon, by the permission of her Majesty, has undertaken to have this magnificent picture engraved, and for that purpose has engaged the services of Mr. Samuel Cousins, whose great talent in the mixed style of engraving has long been admitted. As the picture itself was painted expressly for her Majesty, and will not be publicly exhibited, the country will feel much indebted to the enterprise of Mr. Moon, which promises to place within the reach of all, not absolutely poor, a counterpart of a picture honorable to the art of England, and valuable as a faithful record of an interesting historical event.

Morning Chronicle.

We are happy to see that our gifted countryman, (C. R. Leslie, Esq.) has lost none of his popularity since his return from

his native land. Some few years since, Mr. L. received the appointment from our government, of Prof. of Fine Arts to the Military Academy, West Point; and as it was the highest appointment of the kind in their gift, he hastened to perform its duties. We are sorry to say that the emolument and accommodations offered him, were so trifling when compared with those resulting from the pursuit of his profession in England, that he was compelled to relinquish it.

The Inverted Image on the Retina. However contradictory to itself this fact may appear, it yet in reality requires no explanation; inasmuch as an inverted image not only of the single object, but of the whole field of vision and of our own person also, is formed upon the retina. Where the whole is inverted, the whole must appear right, for the two ideas, viz. of erectness and inversion are only relative, and signify nothing, unless, as being opposed to each other. Besides, it must be remembered, that the idea in the mind is derived from sensation alone; the mind, in perceiving a visible object, is occupied merely with forming an idea from the visual sensation, and does not compare the image produced on the retina by the object with the object itself. But, it will be said, the mind may institute such a comparison by the aid of the sense of touch. In the image of a man upon the retina, for example, the head will be downwards, and the feet upwards; whereas, on touching him, we find the head upwards, and the feet downwards. This apparent contradiction between the two sensations may be very simply explained, if we keep in mind that the idea of upwards is in point of fact of the same import as that of sky-wards, while that of downwards is the same as earthwards. If there is in the mind the intention of touching the head of the person, which in the image upon the retina is towards the sky, and produces a corresponding idea, the mind will naturally determine the organ of touch, *i. e.* the hand, to move itself towards the sky, *i. e.* upwards, and it will accordingly meet the head of the person. This applies equally the other way, viz. to the idea of downwards or towards the earth.

Franz on the Eye.

Substitution of Paper for Metallic Plates in the Daguerreotype.—A new application has been made of the effects of the Daguerreotype, by M. Bayard, a clerk of the French finance department. By the means of a chemical process, he has succeeded in fixing the impressions of the camera obscura upon paper. The number of drawings thus obtained by him is very considerable, and among them there are about twenty which present great perfection. If the outlines of objects are not so clear in the impressions taken on paper, as in those obtained upon the metallic plates, they have a softness in their general effect, which is highly pleasing to the eye. Moreover, the paper, which may receive any colour, has not the inconvenience of the mirage which attends the silver gilt plates. The section of the fine arts of the Royal Institute, to whom M. Bayard has submitted the drawings he has obtained, have

been struck with the extraordinary delicacy with which the objects are re-produced upon the paper; and a most favourable report, drawn up on this new application of the Daguerreotype, by M. Raoul Rochette, will be shortly published in the *Moniteur*.

The Britannia.

Aerial Sailing.—There is being fitted up at the *Ecole Militaire*, Paris, a balloon, intended to sail in the air in any particular direction at the pleasure of the aeronaut, M. Garnerin. On each side of the boat are placed four boards, something like the sails of a windmill, which the aeronaut moves by the assistance of a machine in the interior, the secret of which is only known to himself. The resistance made by the air when struck by one of the boards, acts upon the balloon, and carries it forward like a bird flying. M. Garnerin has already made several essays, which have been completely successful.

The Britannia.

We must beg leave most respectfully to doubt the truth of the above statement, notwithstanding the high authority from which it appears to emanate. Suppose the balloon of ordinary size, its surface on either side would present an area of 1600 square feet, and the force of the pressure from ordinary currents would be 8000 lbs.; add to this the increase by the rate of travel, and we have at least 10,000 lbs. pressure to arrest its progress. A continued force of this amount would be required from the fans to cause it to remain in its position, and if the resisting force were applied unequally, the balloon would undoubtedly be torn; add to this the probable improbability of *any* counter action being obtained from a machine suspended from the balloon itself, and we think our readers will agree that M. Garnerin, could as easily raise himself from the ground in pulling on his boots, as make his project practicable.

By recent experiments made at Metz, it has been ascertained that a 13-pounder impels its ball, with the ordinary charge of powder, 506 yards in the first second of time, and that by increasing the charge, it may be projected 817 yards within the same short space of time.

Naval and Military Gazette.

Doctrine of Colours.—An unpretending little book has just been published by Dr. Franz of Dresden, on "The Eye," in which the physical construction of that organ, and the whole science of optics, are treated in a popular and concise manner. The following views, with respect to colour are not without novelty:—"Light, or rather every ray of light, consists of three primitive colours, blue, yellow, and red. If the surface of an illuminated object be of such a nature as to reflect the ray of light with an equal mixture of these three colours, it will appear white, and the more equal and intimate the mixture, the whiter will be the colour. If, on the contrary, the illuminated surface be of such a na

ture as to decompose the ray and separate either of the three primitive colours; if now it attracts two of these colours to itself, or in other words, absorbs them, it appears of the third, or remaining colour, which not having been absorbed, is reflected: for example, if the blue and yellow be absorbed, the object appears red. But if the object have the property of absorbing one only of the primitive colours, it will then appear of that colour which results from a mixture of the two reflected colours; if, for instance, the red be absorbed, the colour of the object will be green, which results from the mixture of yellow and blue. From the respective degrees in which one or other of the primitive colours predominates in the mixture of the reflected colours, arise the infinitely various gradations and shades of colours, or light. Lastly, if the surface of the object possess the property of absorbing all the three primitive colours, it will then appear black, which will be the more deep and intense, the more perfectly and equally they are absorbed. The object in this case is, indeed, illuminated, but reflects no light."

Jupiter's Fourth Satellite.—Since the 20th of December, 1838, the fourth, or most distant satellite from Jupiter has not been eclipsed by his shadow, occulted by his body, nor transited his disc, in consequence if its geocentric latitude being greater than that of the planet; neither will it do so during the whole of next year, so that this satellite will always be visible when Jupiter is visible. This satellite has been seen, when the sky was very clear, by the naked eye. It is but rarely, however, that we can be favoured with such a sight.

Arbroth Herald.

Metallochromy.—M. Bottiger has obtained some remarkable effects in metallic coloration, by plunging a plate of platina, held in contact with a zinc stem, in a solution of ammoniacal chloride of copper; the platina being consequently maintained in an electro-negative state. The solution of the copper was obtained by agitating the fine copper filings in saturated solution of sal-ammoniac. This solution of copper, which is colorless as long as it is kept in a well-stopped bottle, becomes blue by exposure to the air. If a piece of polished platina be plunged into it, no effect is produced, but if the platina be touched by a piece of zinc, a thin red pellicle of copper is immediately deposited on the surface, which immediately disappears, if the contact with zinc was momentary; but if this contact be permanent, beautiful shades of yellow, green, red, brown and black, soon appear on the platina. These colours may be fixed by withdrawing the platina, and leaving it to dry in the air.

Inventor's Advocate.

The effect stated above, appears to be peculiar to platina, as no colors are produced by similar precipitations of copper, in the experiments of Jacobi and Spencer on other metals.

Gates for the Crossing of Railways.—Mr. T. Lambert, of Stockton-upon-Tees, has constructed a neat model for gates, to be used at the crossings of railways. The gates turn on centres; and are so simple and complete, that one man can open both of them at one time, with the greatest facility. When open, they prevent any one passing on the

railway, and admit the progress of carriages, carts, &c. on both sides of the turnpike. Each gate is also furnished with an elevated circular signal, containing a lamp, which turns with the gate, so that whether it be night or day, persons at a great distance will be enabled to see when danger is announced. We have had the pleasure of examining the model, and can say with truth, that the invention seems to effect everything necessary for the protection of life and property at crossings, while it allows the greatest facility for passing on the road. *Sunderland Herald*

Ill Effects of Rapid Variations of Light on the Eyes.—Sudden changes from comparative darkness to strong light, and *vice versa*, are highly improper, inasmuch as they cause the iris to contract and dilate rapidly, and thus weaken it; hence, the eyes should be carefully guarded from the full effect of the morning sun on first awaking in summer; and the custom of breakfasting in the lightest room of the house, as is generally done, certainly weakens the eyes, which ought to be accustomed, by gentle transitions, to one degree of light after another, till they can bear the effulgence of the sun's meridian splendor.

Curtis on the Preservation of the Sight.

Engineering and Machinists of France.—There prevails a general opinion in France, that, in the construction of machinery, that country is very much behind England, and that French mechanics are very inferior to the English. Yet, the fact is, that not only has more machinery and machinery of greater importance, been invented and brought to perfection in France than in England, but that, notwithstanding the greater cost of iron and of casting, she can furnish, at the same price as England, steam engines, and locomotive power of every description, on the largest scale.

It is true that this has been the case but for a very short period; still, it is of consequence that public opinion should not be behind the truth. We, therefore, consider it desirable to show, by positive and incontrovertible facts, that we can do more than is generally supposed, and that what is done by others can be done by our own countrymen. We give as a proof the following statement; and we shall shortly furnish additional evidence, by mentioning other similar establishments.

About ten years ago, Messrs. Stehelin and Huber established workshops for the construction of machinery, on their premises at Bitschwiller. At first they proceeded with diffidence, but their intelligent management and some well-executed machinery, soon inspired confidence. As orders arrived, they soon enlarged their workshops, employed more workmen, and provided all the requisite apparatus. Nor did they require much time to effect all this; which will not be doubted, when it is known that the greater part of the machinery which the industry of Alsace employs at the present moment, was made in their workshops, and that some of the engines are of 100 horse power. It is not many days since they delivered at Boulogne-sur-Mer a steam engine of 80 horse power, the beam of which weighs more than 10,000 kilogrammes (9 tons.)

These skilful men have not only employed themselves as engineers, in the construction of steam engines of every description, but have also turned their attention to hydraulic machines, and even to the manufac-

ture of floor cloth, and always with the greatest success, whether we look at the excellence of the work or at the price; and there can be little doubt, from the superiority which they have attained, that there will ultimately be a great demand for their machinery from foreigners.

Not satisfied with the brilliant success which had hitherto attended their efforts, Messrs. Stehelin and Huber, when they perceived that railroads were about to be introduced into France, conceived the ambitious but laudable project of supplying locomotives for these railroads, which should be as good and as cheap as those of England. The result has proved, that in this enterprise, as well as in their former ones, they attempted nothing but what they have been able to accomplish. In their workshops were made many of the locomotives which are now on the railroads to St. Germain and Versailles, and which cost no more at Bitschwiller than at London. Others destined for the railroads of Orleans and Strasburg are in progress. It is needless to enlarge upon the importance of these facts to our country; it must be evident to all the world.

There is at Bitschwiller a hydraulic machine of 60 horse power, and 800 workmen are in constant employment. From these numbers, better than from any detail, an idea may be formed of the magnitude of the establishment of Messrs. Stehelin and Huber. In short, this establishment is not only able to construct engines and machinery on the largest scale, as good as those of England, but to sell them at the same prices. And this is not mere assertion; since the steam engines and locomotives of Messrs. Stehelin and Huber have frequently been, and are every day, compared with those of England; and prove incontestably, that the construction of machinery is not only as perfect in France as in England, but even more so, because, whilst the materials cost more, articles of the most complicated mechanism are produced at the same price.

Moniteur Industriel.

India Rubber Boat.—"There has just been launched on the Neva," says a St. Petersburg letter, "an India-rubber boat. It is made of sail-cloth, impregnated with caoutchouc. It may be rolled up, and in the space of ten minutes can be filled with air by means of four little cocks, by which inflation it assumes the form of a boat. During its trial on the river it held three persons, and excited much attention, as well by the readiness of its movements as by its very pretty appearance."

Those who visited the late Fair of the Mechanics' Institute at Castle Garden, will doubtless recollect the India rubber cloth batteau which floated on the Hudson, opposite the Garden, and contained fifty men and a 24-pounder, which last was fired several times when the river was extremely rough, without at all injuring the batteau. This apparatus could be packed in a box 3 feet long, 18 inches deep, and 12 inches wide.

Engine worked by Compressed Air.—A patent of importation has just been granted in this country (Belgium,) to M. Houdin, the object of

which is to substitute the action of air for the action of steam, and the principle of which depends no longer on the dilation, but on the compressibility of that fluid. The present system seems to us ingeniously conceived. We have now the drawings before us: they represent a locomotive. The compressed air is received first in a recipient, nearly equal in volume to the steam-boilers at present employed, capable of a pressure of fifteen atmospheres; it passes from that into a recipient, five times smaller, capable of a pressure of only three atmospheres, whence it discharges itself into a distributive recipient, which directs it to the piston, giving movement to the whole machine.—*A priori*, compressed air, the power of which, always equal to that of steam, appears to us to possess the advantage of being less dangerous, and less expensive in its mechanical application, more regular in the impulse it communicates, and more easy to direct.

Belgian Paper.

We cannot understand by what means the inventor expects to avail himself of any more power from the use of compressed air, than that used in compressing it, minus the friction of the machine by which it is compressed.

West's New Dissecting Microscope.—To determine the true nature of pustular eruptions in a more correct manner than can be effected by the human eye, a very strong and powerful glass is necessary. The proper adjustment of a powerful lens, however, is a matter of considerable difficulty; and to remove this, has been Mr. West's object. In the microscope now before us, every inconvenience appears to be done away with; for, by a simple apparatus affixed to the glass, it can be retained firmly over the part affected without confining the hand of the operator, while a surgical operation is in progress. Botanists, also chemists, mineralogists, and others will find it of equal utility. The price is low, and the shape convenient for the pocket.

Inventor's Advocate.

Thunder.—M. Arago, from some researches he has made, believes it never thunders in the open sea, or in islands beyond 75 deg. of latitude north, and he thinks the same holds good on continents.

Will some correspondent please furnish us with the rationale of the above?

Adhesiveness of Timber. At one of the sectional meetings of the British Association, Mr. Eaton Hodgkinson read a table of different species of woods, and the power which they possess to resist a force tending to crush them. The following are a few of the principal woods and the number of pounds which they would sustain on the square inch without sinking under the pressure. The weight was applied in all the instances in the direction of fibres. Yellow pine, 5,375lbs.; cedar, 5,674lbs.; red deal, 5,748lbs.; poplar, not quite dry, 4,307lbs.; green larch, wet, 2,301lbs.; green larch, dry, 5,368lbs.; plum tree, green, 5,364lbs.; beech, rather green, 7,733lbs.; beech, dry, 9,363lbs.; dry ash, 9,363lbs.; English oak, 5,364lbs.; Spanish mahogany, 5,198lbs.; elm, 10,331lbs.; box, from 9,365, to 10,000lbs.; kingwood, 12,645lb.

The Electro-Magnetic Telegraph of the Great Western Railway.—This telegraph, which is the invention of Mr. Cook, and Professor Wheatstone, of King's College, has been during two months constantly worked at the passing of every train between Drayton, Hanwell, and Paddington. At the former station it for the present terminates. As soon as the whole line is completed, the telegraph will extend from the Paddington terminus to Bristol, and it is contemplated that then information of any nature will be conveyed to Bristol, and an answer received in town in about twenty minutes. Two of the boys from the Deaf and Dumb Asylum in the Kent road have been at the Paddington station for five or six weeks, where they were instructed in the working of the machinery by Mr. Hutchinson, and they are now perfectly competent to superintend the telegraph at any one of the stations. A piece of machinery, simple but unerring, to which is attached a check string to indicate to the boys (who cannot hear the signal bell) when the signal is sent up the line to show that something is about to be telegraphed, has been invented, which enables these lads to perform this duty as efficiently as if they were not suffering under the deprivation of hearing and speech. The telegraph has now been in operation for nearly twelve months, and not the least obstruction to its working, by any of the wires, &c. becoming out of order, has yet occurred. Should such an event take place (especially when the whole line is open to Bristol) it might occur to many that there would be considerable difficulty (as all the wires are enclosed in a hollow tube, not more than about an inch in diameter) in ascertaining throughout the 117 miles, the precise point at which the injury required to be repaired; but this apparent difficulty has been met by Mr. Cook, who has invented a piece of mechanism which is contained in a mahogany case not more than eight inches square, by which means the precise spot on the line where the injury might have been occasioned would be indicated in almost an incredible short space of time. This invention may now be termed perfect in all its details, and only waits the completion of the line to Bristol to bring it into full operation between that city and the metropolis.

Evening Paper.

We believe that the electro-magnetic telegraph, was invented by President Morse of this city, and not by Mr. Cook and Professor Wheatstone, as stated above.

Paper made from the Banana Tree.—The Banana tree has, up to the present time, been cultivated for its fruit only: it has just been discovered that its leaves contain fine filaments which may be successfully employed in the manufacture of paper. The process used in mixing these filaments with the pulp is the same as with rags; as also is the manufacture of the paper, and the whitening of the material. Paper thus manufactured, is stronger, more supple, and less liable to crack, than paper made with rags, especially cotton.

Man. Guard.

Coinage.—Coins are generally completed by one blow of the coining press. These presses are worked in the Royal Mint by machinery, so contrived that they shall strike, upon an average, sixty blows in a

minute; the blank piece, previously prepared and annealed, being placed between the dies by part of the same mechanism. Of these presses, and of the other machinery and operations used and carried on in the mint, an excellent account, with illustrative engravings, has been given by Mr. Mushet, in the Supplement to the Encyclopædia Britannica. The number of pieces which may be struck by a single die of good steel, properly hardened and duly tempered, not unfrequently amounts at the mint to between 300,000 and 400,000; but the average consumption of dies is, of course, much greater, owing to the different qualities of steel, and to the casualties to which the dies are liable; thus, the upper and lower dies are often violently struck together, owing to a fault in the layer-on, or that part of the machinery which ought to put the blank into its place, but which now and then fails to do so. This accident very commonly arises from the boy who superintends the press neglecting to feed the hopper of the layer-on with blank pieces. If a die is too hard, it is apt to break or split, and especially subject to fissures, which run from letter to letter upon the die. If too soft, it swells, and the collar will not rise and fall upon it, or it sinks in the centre, and the work becomes distorted and faulty. He, therefore, who supplies the dies for an extensive coinage, has many casualties and difficulties to encounter. There are eight presses at the Mint, frequently at work for ten hours each day, and I consider that the destruction of eight pair of dies per day (one pair for each press) is a fair average result, though we much more frequently fall short of than exceed this proportion. It must be remembered, that each press produces 3,600 pieces per hour; but making allowance for occasional stoppages, we may reckon the daily produce of each press at 30,000 pieces; the eight presses, therefore, will furnish a diurnal average of 240,000 pieces.

Brande's Journal.

Use of the Barometer.—1. The rising of the mercury presages, in general, fair weather, and its falling, foul weather, as rain, snow, high winds, and storms.

2. In very hot weather, especially if the wind is south, the sudden falling of the mercury foretels thunder.

3. In winter, the rising indicates frost; and in frosty weather, if the mercury falls three or four divisions, there will follow a thaw; but if it rises in a continued frost, snow may be expected.

4. When foul weather happens soon after the falling of the mercury, it will not be of long duration; nor are we to expect a continuance of fair weather, when it soon succeeds the rising of the quicksilver.

5. If, in foul weather, the mercury rises considerably, and continues rising for two or three days before the foul weather is over, a continuance of fair weather may be expected to follow.

6. In fair weather, when the mercury falls much and low, and continues falling for two or three days before rain comes, much wet must be expected, and probably high winds.

7. The unsettled motion of the mercury indicates changeable weather.

8. Respecting the words engraved on the register-plate of the barometer, it may be observed, that they cannot be strictly relied upon to correspond exactly with the state of the weather; though it will in

general agree with them as to the mercury rising and falling. The words deserve to be particularly noticed when the mercury removes from "changeable" upwards; as those on the lower part should be adverted to, when the mercury falls from "changeable" downwards. In other cases, they are of no use; for, as its rising in any part forebodes a tendency to fair, and its falling to foul weather, it follows that, though it descend in the tube from settled to fair, it may, nevertheless, be attended with a little rain; and when it rises from the words "much rain" to rain," it shows only an inclination to become fair, though the wet weather may still continue in a less considerable degree than it was when the mercury began to rise. But if the mercury, after having fallen to "much rain," should ascend to "changeable," it foretels fair weather, though of a shorter continuance than if the mercury had risen still higher; and so, on the contrary, if the mercury stood at "fair" and descends to "changeable," it announces foul weather, though not of so long continuance as if it had fallen lower.

9. Persons who have occasion to travel much in the winter, and who are doubtful whether it will rain or not, may easily ascertain this point by the following observation:—A few hours before he departs, let the traveler notice the mercury in the upper part of the tube of the barometer: if rain is about to fall, it will be indented or concave; if otherwise, convex or protuberant.

When the character of the season is once ascertained, returns of rain or fair weather may be judged of with some degree of certainty in some years, but scarcely guessed at in others, by means of the barometer; for, in general, we may expect, that when the mercury rises high, a few days of fair weather will follow. If the mercury falls again in two or three days, but soon rises high, without much rain, we may expect fair weather for several days; and, in this case, the clearest days are after the mercury begins to fall. In like manner, if the mercury falls very low, with much rain, rises soon, but falls again in a day or two, with rain; a continuance of bad weather may be feared. If the second fall does not bring much rain, but the mercury rises gradually pretty high, it prognosticates settled good weather of some continuance. When a heavy rain has fallen upon the mercury's sinking, and its continuing steadily low, the weather is sometimes fair, and promises well; but no prudent farmer should trust to such appearances. There is, indeed, a caution of this kind which the poorest may profit by. When the mercury rises high in the barometer, the moisture on the surface of the earth disappears; this, even though the sky be overcast is a sure sign of fair weather; but if the earth continue moist, and water stands in shallow places, no trust should be put in the clearest sky, for it is in this case deceitful.

Towards the end of March, or more generally in the beginning of April, the barometer sinks very low, with bad weather; after which, it seldom falls lower than 29 degrees 5 minutes, till the latter end of September or October, when the quicksilver falls again low, with stormy winds, for then the winter constitution of the air takes place. From October to April, the great falls of the barometer are from 29 degrees, 5 minutes, to 28 degrees, 5 minutes, and sometimes lower; whereas, during the summer constitution of the air, the quicksilver seldom falls lower

than 29 degrees 5 minutes. It therefore follows, that a fall of an one-tenth of an inch, during the summer, is as sure an indication of rain, as a fall of between two and three-tenths is in the winter.

It must however be observed, that these heights of the barometer hold only in places nearly on a level with the sea; for experiments have taught us, that for every eighty feet of nearly perpendicular height that the barometer is placed above the level of the sea, the quicksilver sinks one-tenth of an inch; observations alone, therefore, must determine the heights of the quicksilver, which in each place denote either fair or foul weather.

Very heavy thunder-storms happen, without sensibly affecting the barometer; and in this case the storm seldom reaches far. When a thunder storm is attended with a fall of the barometer, its effect is much more extensive. When the quicksilver falls very low, and the weather continues mild and the wind moderate, there is at the same time a violent storm in some distant place; this accounts for a false prognostic, with which the barometer has often been unjustly charged. The effects which heat, cold and wind, severally produce on the glass, independently of the dry or humid state of the atmosphere, should likewise be considered.

From the preceding remarks and facts, it will be obvious to the reflecting reader that a barometer is almost as useful an appendage to the farmer as any other implement; for, as an intelligent writer in the "Agricultural Magazine" has observed, unless his operations are conducted with an attentive eye to the present or probably future state of the weather, as well as soil, the produce of his labors will either fall far short of his expectations, or (which to him is equally fatal) will suffer from ill-timed though otherwise commendable exertions to house it.

It is a curious fact, that notwithstanding every merchant vessel has a barometer, and considers it more important than any other instrument except the compass, still there were but seven barometers in the United States Navy two years ago. We have this from good authority, and hope some member of the Navy Board will explain the anomaly.

We are informed that only a few years ago, there was not a barometer or a chronometer furnished in the British Naval service, as a public naval store.

New Mode of Producing Wrought or Malleable Iron direct from the Ore.—The following article, which we extract from the *Whitehaven Herald*, has been elicited by a letter from Mr. Clay, which appeared in a late number of this journal. The subject is one of much importance, and we are pleased to find that it is attracting general attention:—"Mr. Clay having recently located himself in this county, and introduced into this neighborhood a new and important branch of iron works, we wish to call attention to this new process, because we flatter ourselves that Whitehaven is the very best place in the kingdom for carrying on the extensive manufacture of iron on Mr. Clay's plan. It is pretty generally

known that the richest and purest of the red ores of iron abound in this neighborhood, similar to what is wrought so extensively in Furness, and called in Mr Clay's letter 'Ulverstone ore.' We believe ore of this description is not anywhere found in the coal fields or interstratified with coal, yet in this neighborhood it lies almost contiguous to coal, and very conveniently for bringing on to the West Cumberland Railway. This iron ore contains from 92 to 96 per cent. of pure oxide of iron (that is, almost pure rust of iron.) It is currently reported, that many years ago, attempts were made to smelt the ore in this neighborhood, but that they failed on account of the richness of the ore extinguishing the fire in ordinary blast furnaces, when it entered into a state of fusion; and it is well known that the purpose for which it is so extensively exported to South Wales and other iron districts, is to promote the running of iron from the poor iron stones that abound interstratified with the coal in those districts. Mr. Clay's operation being a simple de-oxidation of the metal by exposure to a certain degree of heat or conjunction with carbonaceous matter, we cannot perceive any necessity for the extremely expensive apparatus of close retorts, which must add most seriously to the cost of the product, as well as greatly limit the extent of the produce. We cannot entertain a doubt but that in practice it will be found that suitable reverberating furnaces can be constructed to effect the de-oxidation, and by having each new charge introduced at a high temperature from another contiguous furnace, the operation may be continuously carried on, and any quantity of the de-oxidized or 'prepared ore,' may thus be passed forward to the balling or puddling furnaces. The beautiful simplicity of this operation, we think, must speedily attract the general attention of intelligent men connected with the iron trade, and especially those interested in procuring iron in the highest state of purity; but we can easily perceive how a company situated at Liverpool, or in any of the great iron districts, may have good reason for rejecting an operation, which, if successful, would tend to remove the manufacture of iron from their respective localities. We wish some capitalist in this neighborhood would give special attention to the subject, as the circumstances stated by Mr. Clay promise results of the very greatest importance."

Mon, Herald.

Plate Glass.—The manufactory of St. Gobian, near Paris, has lately cast an enormous plate of glass in a single piece, which is 195 inches (16 feet 3 inches) high, by 138 inches (11 feet 6 inches) broad.

It is not a little singular, that although the consumption of plate-glass is very large in the United States, it should be all *imported*: In England the duty paid by manufacturers is very high, and yet they find it to their advantage to supply us. The plate-glass works of Messrs. Chance & Co. alone, pay a weekly duty to the British government of £5000 sterling.

Zincotypography.—The public is aware that a correspondence was some time since carried on in THE DISPATCH, between Mr. Grieve and Mr. Brimmer, both of whom claimed the invention of transferring ty-

pographical printing to zinc plates. Several letters have since been forwarded to us on the subject, denying that there is the slightest chance of reducing the invention to any useful purpose; and hence that the present plan of stereotyping pages of letter-press is not likely to be superseded by zincotypography. A few words on this subject will settle the question. When Mr. Grieve commenced transferring typographic printing to zinc, he found the process of producing copies to occupy so much time, that he at first doubted whether the scheme could be made practically useful. Some portion of *The Times* newspaper, which Mr. Grieve printed, astonished the proprietors; but their fears that some individual might think proper to reprint the whole of their journal, and sell it at a diminished price, were soon calmed by an assurance from Mr. Grieve, that by manual labor it would be impossible to produce copies with sufficient rapidity to meet the public demand. However, the light of science has since shed its influence on this, as on every other scheme over which the veil of difficulty and obscurity had hung; and we have it now in our power to state, that Mr. Grieve, the inventor of zincotypography, has prosecuted with indefatigable industry several experiments, with the view of determining the value of the invention, the result of which is, that in a short time he hopes to possess a machine, which shall produce copies equal to any typographic printing, at the rate of 2,000 an hour! The printing machine, and the means of multiplying copies by means of metal plates, produced a complete revolution in the printing trade, and who shall say that zincotypography, will not effect an equally great change? The cost of transferring is a mere trifle, and Mr. Grieve has already succeeded in striking off no less than 15,000 copies from a zinc plate. We have seen the eighth thousandth impression, which is clear, and without what is technically called, a "pick" about it. There is another subject which we must not omit to mention. We stated a short time since that the transfer was effected by means of a chemical process. Mr. Grieve has disabused the impression we entertained; there is no secret whatever in the invention, as every one knows who lays claim to a knowledge of the means of producing lithographed plates, the only difficulty consisted in attaining a rapid mode of printing, and that has been achieved.

London Weekly Dispatch.

Deluges and Earthquakes in China.—M. Edward Blot has recently commenced a series of memoirs which are intended to give a history of the deluges, earthquakes, and alterations of the surface of the soil in China, as contained in ancient Chinese works. Two of these memoirs have been read to the French Academy of Sciences, in the first of which are collected the traditions concerning deluges. Of the two principal deluges which have devastated that country, the one is called that of Yao, and is dated in the twenty-fourth century before our era; and the other, long prior to it, is ascribed to the thirty-fifth century before the christian era, in the time of Fohy, a chief from the eastern mountains of Tibet, who drove the natives of China before him. The books which mention these catastrophes do not attribute them to an overabundance of rain, or any other definite physical cause; but M. E. Blot is led to conclude from geological data—1. That interior seas

must formerly have existed in the desert of Cobi, and have been since emptied by a branch of the Yellow River, and through the gorge of Tay-chy. 2. That the deluge of Yao was occasioned by the simultaneous risings of the two great ranges of mountains to be found on the maps; the first having turned the course of the Yellow River, and the second that of the great Kaing, covering Central China with lakes and marshes, and modifying the courses of rivers. In the second memoir is a statement relating to earthquakes, liftings up of the soil, &c. according to the Chinese annals, which remarkably confirm the facts contained in the first. The earthquakes appear to have been terrible in their results as those of South America, and accompanied by the same dull noises, and in fact are identical in character with those observed by M. Bousingault.

Athenæum.

SCRAPS.

Another alleged Important Discovery.—The following is a description of a new invention, applicable to locomotive engines, which is considered by a number of scientific men (as railway traveling is proceeding so rapidly) well calculated to supply a desideratum, and which is likely to prove a great national benefit, by reducing the expense and increasing the safety of internal intercourse. The advantages of it are—First, the condensing the steam after it escapes from the cylinders, and the water produced thereby returned to the boiler to be wrought over again and again; by which means the boiler is rendered more durable, being kept perfectly free of incrustation or deposit of any kind; and no stoppage is required to take in the water; of course freeing the engine of the burden of carrying a supply along with it. Second, the air that supports the combustion of the fuel is considerably heated previous to entering the ash pit: by which the smoke is completely consumed, although fresh coal be used in the furnace. Consequently, a great saving in the consumption of fuel is effected. It is pleasant to add that an experiment has been made with the apparatus, which is exceedingly simple, and found to answer all the purposes intended, and for which a patent is in progress. The inventors are William and Andrew Symington, whose ingenious talents are likely to be of as great benefit to their country as those of their father, the late William Symington, celebrated as the author and introducer of practical steam navigation.

Cor. of the Edin. Chron.

We hope the above may prove true; but in the absence of details we are compelled to doubt its practicability, from the fact, that a much larger quantity of water would be necessary to condense the steam, than to supply the boilers; therefore by this mode of condensation, there would be no saving in the weight of water to be carried. If the inventor expects to condense by a current of air, all former experiments are against him.

Great Western Steam Ship Company.—A contract to light the premises of this Company with 200 burners has been entered into with the Bristol and Clifton Gas Company. The workmen will thus be enabled to proceed with the iron vessel which the company have in preparation by night as well as by day. Engines intended as reserves for the Great Western are also in course of manufacture.

Bristol Journal.

Eclipses of the Sun and Moon.—In the year 1840 there will be two eclipses of the sun and two of the moon. The eclipses of the sun are on the 4th of March and 27th of August. The first annular, and visible to the whole of Asia; the second is total, and is visible to part of Africa and the Indian Ocean. Those of the moon occur on the 17th of February and the 13th of August. They are both partial—the magnitude of the first being 362 on the southern limb, and the second 607 on the northern limb, the diameter of the moon being reckoned equal to 1.

Annuals.—Our readers will doubtless be surprised to learn, that during the seventeen years that annuals have been published in England, a sum equal to about \$7,000,000 has been expended upon them. We extract the following from the Art Union or Journal of the Fine Arts.

Beyond question the character of the Annuals has deteriorated; the fashion, we might also say the passion, for them, gradually declined. In proportion as they became unprofitable, exertions were relaxed; and if we look through any of the volumes published within the last five or six years, we shall perceive only mediocre engravings from mediocre paintings, while among the contributors to their literary contents we shall now find scarcely a single name of eminence. Publishers who used to pay largely for the assistance of both authors and artists, have been compelled either to abandon their speculations, or dole out recompense very sparingly; and their value as literary works, or as works of art, has nearly, if it have not altogether vanished. Yet they have, undoubtedly, been useful as well as agreeable, profitable as well as pleasant, both to literature and to art; and the sneers directed against them, just at the commencement of their decline, were as unmerited as they were unwise. Before their introduction into England, the Christmas gift books were, as we have stated, and our readers know, paltry pocket books; their successors contained much to interest, and somewhat to instruct; the prints which used to ornament the chimney pieces of houses of the middle class, were tawdry colored daubs, prejudicial to taste, and very often injurious to morality; they were displaced by engravings after the choicest works of our greatest British painters, executed in such a manner as to cultivate the eye, and give employment to the mind; and we are by no means to put out of sight the fact, that the popularity

of the Annuals spread through various channels a very large sum of money every year, such sum being divided among persons whose occupations were beneficial to the country. For some years, nearly 100,000*l.* per annum was thus expended. We shall not be wide of the mark, if we assert, that for several years, 150,000 volumes were circulated. We made in the year 1829, a calculation of the expenses incurred, and on now referring to it, we have no reason to change our opinion of its accuracy; it may interest, or at least, amuse, the curious in such matters, at the same time that it will sustain our argument as to the benefit conferred by this class of works: for 150,000 volumes (including the "guinea" books, of which there were always two or three,) the public paid about 90,000*l.* This sum was thus distributed:

Authors and Editors.....	£6,000
Painters.....	3,000
Engravers.....	12,000
Copperplate Printers.....	4,000
Printers.....	3,500
Paper makers.....	5,500
Binders.....	9,000
Silk manufacturers and leather sellers.....	4,000
For Advertising, &c.....	2,000
Incidental matters.....	1,000
	50,000
Publishers' profits.....	10,000
Retail Booksellers' profits.....	30,000
	£90,000

LIST OF ENGLISH PATENTS,

Granted between the 27th November, and the 27th February, 1840.

George Davey, of Llandndno, Carnarvon, mining agent, for an improved mode of applying water power. Patent dated December 2; six months to specify.

Luke Herbert, of Birmingham, engineer, for improvements in the mechanism and process of packing and pressing various articles of commerce. (A communication.) December 2; six months.

Miles Berry, of Chancery lane, draughtsman, for certain improvements in machinery or apparatus for making or manufacturing pins and sticking them in paper. (A communication.) December 2; six months.

Godfrey Anthony Ermen, of Manchester, cotton spinner, for certain improvements in machinery or apparatus for spinning, doubling, or twisting cotton, flax, wool, silk, or other fibrous materials, part of which improvements are applicable to machinery in general. December 2; six months.

John Evans, of Birmingham, paper maker, for improvements for

chemically preparing and cleansing of felts used by paper manufacturers. December 2; six months.

Henry Dunington, of Nottingham, lace manufacturer, for improvements in machinery employed in making frame work, knit, or stocking fabrics. December 2; six months.

James Guest, Jr. of Birmingham, merchant, for improvements in locks and other fastenings, (being a communication.) December 2; six months.

George Saunder, clerk, of Hooknorton, Oxford, and James Wilmot Newberry, of the same place, farmer, for improvements in machinery for dibbling or setting wheat and other grain or seed. December 2; six months.

Henry Trew hitt, of Newcastle, Esq. for certain improvements in the fabrication of china and earthenware, and in the apparatus or machinery applicable thereto. (A communication.) Dec. 4; six months.

Christopher Nickels, of York road, Lambeth, gentleman for improvements in propelling carriages. (A communication.) Dec. 4; six months.

Pierre Narcisse Cronier, of Fricourts Hotel, Saint Martin's lane, for improvements in filters and in the means of cleansing the same, and for separating, coloring, and tanning matters by filtration, and for improvements in employing such tanning matters by filtration. (A communication.) Dec. 4; six months.

James Mayer, of Ashley crescent, Saint Luke, gentleman, for an improved machine for cutting splints for matches. Dec. 4; six months.

George Lowe, engineer to the chartered Gas Company, and John Kirkham, engineer to the Imperial Gas Company, both of London, for improvements in the manufacture of gas for purposes of illumination. Dec. 4; six months.

James Nasmyth, of Paticroft, near Manchester, engineer, for certain improvements applicable to railway carriages. Dec. 4; six months.

John Heaton Hall, of Doncaster, chemist, for improvements in preserving and rendering woollen and other fabrics and leather waterproof. Dec. 5; six months.

Harold Potter, of Manchester, Esq. for certain improvements in printing calicoes, muslins and other fabrics. Dec. 9; six months.

Samuel White White, of Charlton Marshall, Dorset, Esq. for improvements in preventing persons from being drowned. Dec. 9; six months.

Moses Poole, of Lincoln's inn, gentleman, for improvements in the manufacture of caustic soda, and carbonate of soda, (being a communication.) Dec. 9; six months.

Thomas Richardson, of Newcastle, chemist, for a preparation of sulphate of lead, applicable to some of the purposes for which carbonate of lead is now applied. Dec. 9; six months.

John Leslie, of Conduit street, Hanover square, tailor, for improvements in measuring the human frame. (A communication.) Dec. 9 ; six months.

John Jukes, of Shropshire, gentleman, for improvements in furnaces or fire places, for the better consuming of fuel. Dec. 9 ; six months.

Pierre Frederic Gougy, of Tavistock street, Westminster, watch-maker, for an improvement in clocks, watches and other time keepers. Dec. 11 ; six months.

Robert Hervey, of Manchester, dry salter, for certain improvements in the mode of preparing and purifying alum, alumina, aluminous mordants and other aluminous combinations and solutions, and the application of such improvements to the purposes of manufacture. Dec. 13 ; six months.

Robert Gill Ranson, of Ipswich, paper maker, and Samuel Millbourn foreman to the said R. G. Ranson, for improvements in the manufacture of paper. Dec. 13 ; six months.

Angier March Perkins, of Great Coram street, for improvements in apparatus for transmitting heat by circulating water. Dec. 16 ; six months.

Jacob Brazill, Governor of Trinity Ground, Deptford, for improvements in obtaining motive power. Dec. 16 ; six months.

Henry Seymour Moore Vandeleur, of Kilrush, Ireland, for improvements in paving or covering roads and other ways. Dec. 16 ; six months.

Samuel Walton Faxon, of Park Village East, Regent's park, surgeon, for an apparatus to be applied to the chimnies of gas and other burners or lamps, to improve combustion. Dec. 16 ; six months.

Mounier Japy and Constant Jouffroy Dumery, of George yard, Lombard street, gentlemen, for improvements in rotary engines, to be actuated by steam or water. Dec. 16 ; six months.

David Morison, of Wilson street, Finsbury, ink maker, for improvements in printing. Dec. 16 ; six months.

David Naylor, of Copley Mill, Halifax, manufacturer, and John Crichton, Jr. of Manchester, machine maker, for certain improvements in machinery for weaving single, double, and treble cloths by hand or power. Dec. 16 ; six months.

George Wilson, of Salford, machinist and engineer, for certain improvements in steam whistles, adapted for locomotive engines and boilers, and other purposes. Dec. 16 ; six months.

James William Thompson, of Turnstile alley, Long acre, upholsterer, for improvements in the construction of bedsteads, which improvements are particularly applicable to the use of invalids. Dec. 16 ; six months.

William Newman, of Birmingham, brass founder, for certain im-

proved mechanism for roller blinds, which it is intended to denominate Simcox and Company's patent blind furniture. Dec. 16; six months.

John Robinson, of North Shields, engineer, for an improved steering apparatus. Dec. 16; six months.

John Wood, of Burslam, Stafford, manufacturer of mineral colors, for a new method or process in the application and laying on of the substances used in the printing, coloring, tinting and ornamenting of china, porcelain, earthenware, and other wares of the same description, by which such wares can be painted and ornamented with flowers and other devices in a much cheaper and more simple and expeditious manner than by any process now in use, and colors of all or any variety may be painted, shaded, mixed, and blended together in one of and the same design or pattern, and hardened or burnt into the substance of the aforesaid wares by a single process of firing or hardening in the enameling kiln. Dec. 16; two months.

Joseph Gibbs, of Kennington, engineer, for an improvement or improvements in the machinery for preparing fibrous substances for spinning, and in the mode of spinning certain fibrous substances. December 21; six months.

George Lindsay Young, of Hackney, gentleman, for an improved surface for paper mill or card board vellum, and parchment. Dec. 21; six months.

Henry Francis Richardson, of Ironmonger lane, gentleman, for improvements in omnibusses. Dec. 21; six months.

John Cutts of Manchester, machine maker, and Thomas Spencer of the same place, mechanic, for certain improvements in the machinery or apparatus for making wire cards for carding cotton, silk, wool and other fibrous substances. Dec. 21; six months.

Lawrence Wood Fletcher, of Charlton-upon-Medlock, Manchester, for an improvement or improvements in the manufacture of woollen and other cloths or fabrics, and in the application of such cloths or fabrics to various useful purposes. Dec. 23; six months.

Thomas Firmstone, of Newcastle, coal master, for improvements in the manufacture of salt. Dec. 24; six months.

Alexander Mac Rae, of the London Coffee House, Ludgate hill, for improvements in machinery for ploughing, harrowing, and other agricultural purposes, to be worked by steam or other power. Dec. 24; six months.

Thomas Hardeman Clarke, of Birmingham, cabinet maker, for certain improved fastenings for window sashes, tables, and such like purposes. Dec. 24; six months.

John Leo Nicolas, of Clifton, Bristol, gent. for certain improvements in the method of constructing and propelling carriages on railways and common roads, and through fields for agricultural purposes. Patent dated Jan. 1; six months to specify.

Samuel Lawson, of Leeds, and John Lawson, of the same place,

engineers and copartners, for improvements in machinery for spinning, doubling, and twisting flax, wool, silk and other fibrous substances. (A communication.) Jan. 2; six months.

Charles Greenway, of Douglas, in the Isle of Man, Esq. for certain improvements in reducing friction in wheels of carriages, which improvements are also applicable to bearings and journals of machinery. Jan. 3; six months.

John Francois Victor Fabien, of King William street, London, gent. for improvements in pumps. Jan. 7; six months.

David Low, of Adam's Court, Old Broad street, merchant, for improvements in machinery, for crushing, preparing, and combing flax, hemp, phormium, tenax, and other fibrous substances.) A communication.) Jan. 7; six months.

Moses Poole, of Lincoln's Inn, gent. for improvements in obtaining power. (A communication.) Jan. 7; six months.

John Ridgway, of Cauldon Place, Stafford, china manufacturer, for an improvement in the moulds used in the manufacture of earthenware, porcelain, and other similar substances, whereby such moulds are rendered more durable. Jan. 11; six months.

John Ridgway, of Cauldon Place, Stafford, china manufacturer, and George Wall, the younger, of the same place, gent. for certain improvements in the manufacture of china and earthenware, and in the apparatus or machinery applicable thereto. Jan. 11; six months.

John Ridgway, of Cauldon Place, Stafford; china manufacturer, and George Wall, the younger, of the same place, gent. for certain improvements in the mode of preparing bats of earthenware and porcelain clays, and of forming or shaping them into articles of earthenware and porcelain, and in the machinery, or apparatus applicable thereto. Jan. 11; six months.

Christopher Edward Dampier, of Ware, attorney at law, for an improved weighing machine. Jan. 14; four months.

Hezekiah Marshall, of Canterbury, architect, for improvements in window sashes and frames, and in the fastening of window sashes. Jan. 14; six months.

Arthur Eldreld Walker, of Melton street, Euston square, engineer, for improvements in engraving by machinery. Jan. 18; six months.

Charles Wheatstone, of Conduit street, Hanover square, Esq. and William Fothergill Cooke, of Sussex Cottage, Slough, Esq. for improvements in giving signals, and sounding alarms at distant places, by means of electric currents. Jan. 21; six months.

Samuel Brown, of Finsbury Pavement, C. E. for improvements in making casks, and other vessels of, or from iron and other metals. Jan. 21; six months.

Joseph Rock Cooper, of Birmingham, gun maker, for improvements in fire arms, and in the balls to be used therewith. Jan. 21; six months.

William Stone, of Wimsley, gentleman, for improvements in the manufacture of wine. Jan. 21; six months.

James Hall, of Glasgow, upholsterer, for improvements in beds, mattresses, and apparatus applicable to bedsteads, couches, and chairs. Jan. 21; six months.

Arthur Howe Holdsworth, of Brookhill, Devon, Esq for improvements in preserving wood from decay. Jan. 21; six months.

William Coltman, of Leicester, framesmith, and Joseph Wale of the same place, framesmith, for improvements in machinery employed in making frame work knitting or stocking fabrics. Jan. 21; six months.

Samuel Wilkes, of Darlestone, iron founder, for improvements in the manufacture of hinges. Jan. 21; six months.

George Wilson, of St. Martin's court, St. Martin's lane, for an improved paper cutting machine. Jan. 21; six months.

Charles Rowley, of Birmingham, stamper and piercer, and Benjamin Wakefield of Bordesley, machinist, for improved methods of cutting out, stamping or forming and piercing buttons, shells, and backs for buttons, washers, or other articles from metal plate, with improved machinery and tools for those purposes. Jan. 21; six months.

Edward Halliley, of Leeds, cloth manufacturer, for improvements in machinery for raising pile on woollen and other fabrics. Jan. 21; six months.

William Hunt, of the Portugal Hotel, Fleet street, London, manufacturing chemist, for improvements in the manufacture of potash and soda, and their carbonates. Jan. 21; six months.

Miles Berry, of Chancery lane, for certain improvements in the manufacture of prussiate of potash and prussiate of soda. (A communication.) Jan. 21; six months.

Jules Alphonse Simon de Gournay, of Bread street, London, gentleman, for improvements in the manufacture of horse shoes. (A communication.) Jan. 22; six months.

George Clarke, of Manchester, manufacturer, for certain improvements in the construction of looms for weaving. Jan. 23; six months.

Alexander Helt, of Gower street, Bedford square, surgeon, for certain improvements in the arrangement and construction of fire grates or fire places, applicable to various purposes. Jan. 23; six months.

James Bingham, of Sheffield, manufacturer, and John Amory Boden, of the same place, manufacturer, for certain improved compositions which are made to resemble ivory, bone, horn, mother of pearl, and other substances applicable to the manufacture of handles of knives, forks, and razors, pianoforte keys, snuff boxes, and various other articles. Jan. 25; six months.

Robert Montgomery, of Johnstone, Renfrew, gentleman, for an improvement or improvements in spinning machinery, applicable to mules, jennies, slubbers, and other similar mechanism. Jan. 25; six months.

Thomas Aitken, of Chadderton, Lancaster, manufacturer, for certain improvements in the machinery or apparatus for drawing cotton and other fibrous substances. Jan. 28; six months.

James Smith, Jr. and Francis Smith, of Spital works, near Chesterfield, lace manufacturers, for certain improvements in machinery for the manufacture of figured bobbin net or lace. Jan. 28; six months.

William Pontifex, of Shoe lane, London, coppersmith, for an improvement in treating fluids containing coloring matter, to obtain the coloring matter therefrom. Jan. 28; six months.

Henry Curzon, of Kidderminster, machinist, for certain improvements in steam engines. Jan. 28; six months.

John Whitehouse, of West Bromwich, Stafford, iron master, for improvements in preparing and rolling iron and other metals, or metallic alloys for the manufacture of certain articles of commerce. Jan. 28; six months.

William Mattershaw Forman, of Sheepshead, Leicester, framesmith, for certain improvements in stocking frames and machinery used in frame work knitting. Jan. 28; six months.

William Cubitt, of Gray's Inn road, Middlesex, builder, for certain improvements in roofing. Jan. 31; six months.

Moses Poole, of Lincoln's inn, gentleman, for improvements in pumps for raising and forcing water and other fluids. (A communication.) Jan. 30; six months to specify.

William Brockedon, of Queen square, Middlesex, Esq. for improvements in the means of retaining fluids in bottles, decanters, and other vessels. Jan. 31; six months.

Philippe Marie Moindron, of Bedford place, Russell square, merchant, for improvements in the construction of furnaces and in boilers. (A communication.) Jan. 31; six months.

William Cubitt, of Gray's-inn-road, builder for an improvement or improvements in roofing, Jan. 31; six months.

Crofton William Moat, of Thistle grove, Brompton, Esq. for a new and improved method of applying steam power to carriages on ordinary roads. Feb. 5; six months.

Wilkinson Steele and Patrick Sanderson Steele, manufacturing iron-mongers, of George street, Edinburgh, for improvements in kitchen ranges for culinary purposes, and apparatus for raising the temperature of water for baths and other uses. Feb. 5; six months.

William Isaac Cookson, of Newcastle-upon-Tyne, Esq. for certain improved processes or operations for obtaining copper and other metals from metallic ores. Feb. 5; six months.

Thomas Myerscough, of Little Bolton, manager, and William Sykes, of Manchester, machine maker, for certain improvements in the construction of looms for weaving or producing a new or improved manu-

facture of fabrics, and also in the arrangement of machinery to produce other descriptions of woven goods or fabrics. Feb. 5; six months.

Samuel Carson, of Caroline street, Coleshill, Eaton square, Middlesex, gentleman, for improvements in apparatus for withdrawing air or vapors. Feb. 5; six months.

Joseph Needham Taylor, of Plymouth, captain in the Royal Navy, for improvements in steam boats and vessels, making applicable the power of the steam engine to new and useful purposes of navigation. Feb. 8; six months.

John Werthemier, of West street, Finsbury circus, printer, for certain improvements in preserving animal and vegetable substances and liquids. (A communication.) Feb. 8; six months.

Robert Beart, of Godmanchester, miller, for improvements in apparatus for filtering fluids. Feb. 8; six months.

Amand Deplanque, of Leicester square, gentleman, for improvements in looms for weaving. (A communication.) Feb. 8; six months.

Edmund Rudge, Jr. of Tewkesbury, tanner, for a new method or methods of obtaining power for locomotive and other purposes and of applying the same. Feb. 8; six months.

James Hancock, of Gloucester place, Walworth, for a method of forming a fabric or fabrics applicable to various uses, by combining caoutchouc, or certain compounds thereof, with wood, whalebone, or other fibrous materials, vegetable or animal, manufactured or prepared for that purpose, or with metallic substances manufactured or prepared. Feb. 8; six months.

George Eugene Magnus, of Manchester, merchant, for certain improvements in manufacturing, polishing and finishing slate, and in the application of the same to domestic and other useful purposes. Feb. 8; six months.

Robert Willis, of the University of Cambridge, clerk, for improvements in apparatus for weighing. Feb. 12; six months.

David Napier, of York road, Lambeth, engineer, for improvements in the manufacture of projectiles. Feb. 12; six months.

Antoine Blanc, of Paris, merchant, and Theophile Gervais Bazille, of Rouen, merchant, for certain improvements in the manufacturing or producing soda, and other articles obtained by or from the decomposition of common salt or chloride of sodium. Feb. 12; six months.

Thomas Robinson Williams, of Cheapside, gentleman, for certain improvements in the manufacture of woollen and other fabric or fabrics of which wool or fur form a principal component part, and in the machinery employed for effecting that object. Feb. 14; six months.

Joseph Clarke, of Boston, printer, for improvements in piano fortes. Feb. 14; six months.

Gerrard Ralston, of Tokenhouse yard, merchant, for improvements

in rolling puddle balls or other masses of iron. (A communication.) Feb. 22; six months.

Richard Cuerton, Jr. of Percy street, Middlesex, brass founder, for improvements in the manufacture of cornishes, mouldings, and window sashes. (A communication.) Feb. 22; six months.

William Cook, of King street, Regent street, coachmaker, for improvements in carriages. Feb. 22; six months.

Thomas Kerr, of Forecrofts Dunse, in the county of Berwick, Esq. for a new and improved mortar or cement for building, also for mouldings, castings, statuary, tiles, pottery, imitations of soft and hard rocks, and other useful purposes, and which mortar or cement is applicable as a manure for promoting vegetation and destroying noxious insects. Feb. 22; six months.

John Hanson, of Huddersfield, engineer, for certain improvements in meters, for measuring volumes of gas, water, and other fluids, when passed through them, and in the construction of cocks or valves applicable to such purposes. Feb. 22; six months.

William Winsor, of Rathbone place, artists' colorman, for a certain method or certain methods of preserving and using colors. Feb. 22; six months.

Job Cutler, of Lady Pool lane, Birmingham, gent. and Thomas Gregory Hancock, of Highgate, Birmingham, aforesaid, machinist, for an improved method of cutting corks and constructing the necks of bottles. Feb. 22; six months.

William Brindley, of Northwood street, Birmingham, for improvements in apparatus employed in pressing cotton wool and goods of various descriptions. Feb. 25; six months.

Thomas Huckrale, of Over Norton, Oxford, farmer, for improvements in ploughs. Feb. 25; six months.

Thomas Farmer, of Gunnersbury House, near Acton, Middlesex, Esq. for improvements in treating pyrites to obtain sulphur, sulphureous acid, and other products. Feb. 25; six months.

John Wilson, of Liverpool, lecturer on chemistry, for an improvement or improvements in the process or processes of manufacturing the carbonate of soda. Feb. 25; six months.

Richard Kingdon, of Gothic House, Stockwell, surgeon, for certain improvements in apparatus for the support of the human body, and the correction of curvatures and other distortions of the spine of the human body. Feb. 25; six months.

Thomas Milner, of Liverpool, safety box manufacturer, for certain improvements in boxes, safes, or other depositories, for the protection of papers, or other materials from fire. Feb. 26; six months.

William Morritt Williams, of Bedford place, Commercial road, professor of mathematics, for an improved lock and key. Feb. 27; six months.

Rowland Macdonald Stephenson, of Upper Thames street, in the city of London, civil engineer, for certain improvements in shifting and working stage scenes, and other theatrical machinery. Feb. 28; six months.

LIST OF SCOTCH PATENTS,

Granted from November 22d, to 1839, February 19th, 1840.

Thomas Kerr, Esq. of Forecrofts, Dunse, Berwick, for a new and improved mortar or cement for building and other purposes. Sealed 23d of November, 1839; four months to specify.

William Miller, of Clitheroe, Lancaster, engineer, for certain improvements in grates used in steam engine or other furnaces or fire places. Dec. 5.

John Swindells, of Manchester, Lancaster, manufacturing chemist, for certain improvements in the manufacture of Prussian Blue, prussiate of potash, and prussiate of soda. Dec. 5.

Francois Vonillon, of Princes street, Hanover square, Middlesex, silk mercer, (a communication from a certain foreigner residing abroad) for improvements in the manufacture of ornamental woven fabrics. December 6.

George Lowe, engineer to the chartered Gas Company, and John Kirkham, engineer to the Imperial Gas Company, both of London, for improvements in the manufacture of gas for purposes of illumination. Dec. 6.

John Jukes, of Shropshire, gentleman, for improvements in furnaces and fire places, for the better consuming of fuel. Dec. 12.

Moses Poole, of Lincoln's inn, Middlesex, gentleman, (a communication from a certain foreigner residing abroad,) for improvements in looms for weaving. Dec. 12.

Charles Dod, of 21 Craven street, Strand, Middlesex, gentleman, (a communication by a certain foreigner residing abroad,) for certain improvements in the construction of railways and tram roads, and in the carriages to be used thereon and otherwise. Dec. 18.

Charles Cowan, of Penicuick, Edinburgh, paper manufacturer, and Adam Ramage, of Valleyfield, in the same county, paper maker, for improvements in machinery used in the manufacture of paper. December 19.

William Palmer, of Sutton street, Clerkenwell, Middlesex, lamp-maker, for improvements in lamps and in the manufacture of candles. Dec. 21.

John Sutton, of John street, Roupell street, Lambeth, Surrey, machinist, for improvements in obtaining power. Dec. 21.

Ambrose Bowden Johns, of Plymouth, in the county of Devon, artist, for improvements in coloring or painting walls and other surfaces, and preparing materials used for that purpose. Dec. 21.

Antonio James Mayor, of Ashley crescent, St. Luke, Middlesex, gentleman, for an improved machine for cutting splints for matches. Dec. 21.

James Hay, of Belton, in Haddington, Scotland, captain in the royal navy, for an improved plough, "the Belton Plough." Sealed December 23, 1839; four months to specify.

Christopher Nickels, of the York road, Lambeth, Surrey, gentleman, (a communication,) for improvements in propelling carriages. Dec. 24.

Joseph Gibbs, of Kennington, Surrey, engineer, for an improvement or improvements in the machinery for preparing fibrous substances for spinning, and in the mode of spinning certain fibrous substances. December 24.

Thomas Edmondson, of Manchester, Lancaster, clerk, for certain improvements in printing presses. Dec. 31.

James Nasmyth, of Paticroft, near Manchester, engineer, for certain improvements applicable to railway carriages. Dec. 31.

Thomas Laurente Lamy Godard, of Christopher's street, Finsbury square, London, merchant, (a communication from a certain foreigner,) for improvements in looms for weaving, to be worked by steam or other power. Jan. 8, 1840.

John Bradford Furnival, of Street Ashton, Warwick, farmer, (a communication from a foreigner,) for improvements in apparatus or materials to prevent persons and quadrupeds sinking when in the water. January 8.

George Wilton Turner, late of Park village, Regent's park, Middlesex, but now of Newcastle-upon-Tyne, Doctor of Philosophy, and Herbert Minton, of Longfield Cottage, Stoke-upon-Trent, Stafford, manufacturer, for an improved porcelain. Jan. 9.

Richard Beard, of Egremont place, New Road, Middlesex, gentleman, (a communication from a certain foreigner,) for improvements in printing calicoes and other fabrics. Jan. 9.

Alexander Francis Campbell, of Great Plumpstead, Norfolk, Esq. and Charles White, of Norwich, mechanic, for improvements in ploughs, parts of which improvements are applicable to harrows and other agricultural implements. Jan. 9.

Robert Montgomery, of Johnston, Renfrew, Scotland, gentleman, for an improvement or improvements in spinning machinery, applicable to mules, jennies, slubbers, and other similar mechanism. Jan. 9.

William Vickers, of Firs-hill, York, steel manufacturer, (a communication from a foreigner,) for an improvement in the manufacture of cast steel. Jan. 10.

Christopher Edward Dampier, of Ware, Hertford, attorney at law, for an improved weighing machine. Jan. 14.

John Leslie, of Conduit street, Hanover square, Middlesex, tailor, (a communication,) for improvements in measuring the human figure. Jan. 15.

Thomas Clark and Charles Clark, of Wolverhampton, Stafford, iron founders and co-partners, for improvements in glazing and enameling cast iron hollow ware. Jan. 15.

William Harper, of Cowper's court, Cornhill, London, patent stove manufacturer, and Thomas Walker, of Birmingham, Warwick, for improvements in stoves and grates, and in preparing metal plates for such stoves, and for other purposes. Jan. 15.

Matthew Heath, of Furnival's Inn, London, gentleman, (a communication from a certain foreigner,) for improvements in clarifying and filtering water, beer, wine and other liquids. Jan. 15.

John Ainsley, farmer, Redheugh, near Dalkeith, for a machine for an new and improved mode of making or moulding tiles, bricks, retorts, and such like work from clay. Jan. 20.

Samuel White White, of Charlton Marshall, Dorset, Esq. for improvements in preventing persons from being drowned. Jan. 20.

Arthur Eldred Walker, of Melton street, Euston square, engraver, for improvements in engraving by machinery. Jan. 20.

Robert Lorimer, brass founder, No. 45 Jamaica st. Glasgow, North Britain, an improvement or improvements on stoves. Sealed Jan. 25, 1840; four months to specify.

Miles Berry, of Chancery, lane, Middlesex, (communication from a foreigner,) an invention or discovery by which certain textile or fibrous plants are rendered applicable to making paper, and spinning into yarns, and weaving into cloth, in place of flax, hemp, cotton, and other fibrous materials commonly used for such purposes. Jan. 27.

John Jones of Westfield place, Sheffield, York, a new frying and grilling pan for the cooking of steaks, chops and other meats. Jan. 29.

Robert Hervey, of Manchester, Lancaster, dry salter, certain improvements in the mode of preparing and purifying alum, alumina, aluminous mordants and other aluminous combinations and solutions, and the application of such improvements to the purposes of manufacture. Jan. 31.

Francis Worrell Stevens, of Chigwell, Essex, school master, certain improvements in apparatus for propelling boats and other vessels on water. Feb. 1.

William Isaac Cookson, of Newcastle-upon-Tyne, Esq. certain improved processes or operations for obtaining copper and other metals from metallic ores. Feb. 3.

George Wilson, of St. Martin's court, St. Martin's lane, Middlesex, stationer, an improved paper cutting machine. Feb. 3.

Miles Berry, of Chancery lane, Middlesex, (communication from a foreigner,) certain improvements in machinery or apparatus for making or manufacturing pins, and sticking them in paper. Feb. 5.

Godfrey Anthony Ermen, of Manchester, Lancaster, cotton spinner, certain improvements in machinery or apparatus for spinning, doubling,

or twisting cotton, flax, wool, or other fibrous materials, part of which improvements are applicable to machinery in general. Feb. 5.

James Capple Miller, of Manchester, Lancaster, gentleman, certain improvements in printing calicoes, muslins and other fabrics. Feb. 7.

John Alexander Philip de Val Marino, of No. 17 Clifford st. Bond st. Middlesex, Esq. certain improvements in the manufacture of gas, and in the apparatus employed for consuming gas for the purposes of producing light. Feb. 7.

John Francis Victor Fabien, of King street, London, gentleman, (communication from a foreigner,) improvements in pumps. Feb. 12.

Jonathan Fell, of Workington, Cumberland, ship builder, improvements in building ships and other vessels. Feb. 12.

John Reynolds, of Victoria Hotel, Euston square, Middlesex, Esq. improvements in the manufacture of salt. Feb. 12.

Henry Pinkus, late of Pennsylvania, in the United States of America, but now of 79 Oxford street, Middlesex, gentleman, improvements in inland transit, some of which improvements are applicable to, and may be combined with, an improved method of, or apparatus for, communicating and transmitting, or extending, motive power, by means whereof carriages or waggons may be propelled on railways or roads, and vessels may be propelled on canals. Feb. 19.

LIST OF IRISH PATENTS,

Granted from November, 1839, to January 22d, 1840.

T. N. Raper, for improvements in rendering fabrics and leather water proof.

H. Zander, for improvements in steam engines, steam boilers, or condensers.

Samuel Hall, for improvements in steam engines, and in propelling.

P. A. Ducote, for certain improvements in printing china, porcelain, earthenware, and other wares, and for printing on paper, calicoes, silks, woollens, oil cloths, leather, and other fabrics, and for an improved material to be used in printing.

A. F. Campbell and C. White, for certain improvements in ploughs, harrows, scarifiers, cultivators and horse hoes.

W. H. Hornley and W. Kenworthy, for certain improvements in the machinery or apparatus for sizing or otherwise preparing cotton, woolen, flax, or other warp for weaving.

J. A. Tulk, for certain improvements in the manufacture of iron.

J. T. L. Goodard, for improvements in looms for weaving, to be worked by steam or other power.

Joseph Gibbs, for an improvement or improvements in machinery for

preparing fibrous substances for spinning, and in the mode of spinning certain fibrous substances.

Miles Berry, for an invention or discovery by which certain textile or fibrous plants are rendered applicable to making paper, and spinning into yarns, and weaving into cloth, in place of flax, hemp, cotton, and other fibrous materials commonly used for such purposes.

Edward Dampier, for an improved weighing machine.

George Chapman, for certain improvements in steam engines. Jan. 22.

LIST OF AMERICAN PATENTS,

Granted from February 12th, to March 19th, 1840.

Daniel Williams, New-York, measuring the Human Body for Cutting Garments. Patented February 18th, 1840.

Elijah W. Welsh, of Paris, Va. Oiling Mill Spindles. Patented February 18th, 1840.

William Church, (American Citizen) Birmingham, England, Improvements in Buckles, Clasps, Hooks, and Eyes, and other fastenings, principally applicable to Wearing Apparel. Patented February 18th, 1840.

Isaac Straub, of Cincinnati, Ohio, Portable Grist Mill to be driven by Horse Power. Patented February 18th, 1840.

George F. Bigelow, of Norfolk, Va. improvement in Constructing Ships. Patented February 18th, 1840.

W. R. Greenleaf and Alonzo Cole, Gerry, New-York, improvement in the machine for Cutting Veneers. Patented February 18th, 1840.

Charles E. King, Mount Pleasant, Ohio, constructing Saddles. Patented February 21, 1840.

Samuel Davis, Mifflin, Pennsylvania, machine for Punching Sheet Iron. Patented February 21st, 1840.

Isaac Richardson, Paoli, Pennsylvania, Lime Kiln. Patented February 21, 1840.

John McCrone, of Ellicott's Mills, Maryland, machine for making Wrought Iron Spikes. Patented February 21st, 1840.

John Thorpe and William G. Angell, of Providence, R. I. Knotted Heddle Stuff, of which Weavers' Eye Harnesses are intended to be made. Patented February 26th, 1840.

John Dutton, Jr. Aston, Pennsylvania, improvement in the Endless Chain of Water Buckets for Propelling Machinery. Patented February 26th, 1840.

John D. Aikin, Columbus, Pennsylvania, machine for Drawing Stumps. Patented February 26th, 1840.

- Moore R. Fletcher*, of Boston, Massachusetts, Truss Pad for cure of Hernia. Patented February 26th, 1840.
- Joseph Hanchett*, Cold Water, Michigan, machine for excavating Ditches, &c. Patented February 28th, 1840.
- Chester Gorham*, Barre, Massachusetts, mode of Pressing Palm Leaf Hats. Patented March 3d, 1840.
- John Hart*, of Lebanon, Kentucky, improvement in Bedsteads. Patented March 3d, 1840.
- Sylvester Penfield*, of Hartford, Connecticut, Fire Escape. Patented March 3d, 1840.
- Charles F. Johnson*, Tioga, N. Y. improvement in Dry Docks. Patented March 6th, 1840.
- Benjamin M. Bosworth*, Warren, R. I. Latch and Lock for Doors. Patented March 6th, 1840.
- Lewis Hotchkiss and Willis Hotchkiss*, Derby, Connecticut, Door Latch. Patented March 6th, 1840.
- James Hodge*, Fair Play, S. C. machine for making Bricks. Patented March 6th, 1840.
- Lucius Stebbins*, Hartford, Connecticut, machines for coloring Maps. Patented March 6th, 1840.
- Enoch Thomas*, New Athens, Ohio, improvement called Thomas's Her-nial and Uterine Elastic and Spring Supporter. Patented March 12th, 1840.
- Isaac N. Stanley*, Philadelphia, Pa. improvement in Railroad Cars for turning strong Curves, and for changing from one track to another without the use of Switches. Patented March 12th, 1840.
- William Thomas*, Hingham, Mass. machine for Heading Spikes. Patented March 14th, 1840.
- Casper Kittinger*, Massilon, Ohio, mode of Veneering. Patented March 14th, 1840.
- Herbert H. Stimpson*, Boston, Mass. Cooking Ranges. Patented March 14th, 1840.
- John W. Post*, Baltimore, Maryland, machine for Breaking Dough for Baking. Patented March 14th, 1840.
- G. W. Hildreth*, Lockport, New-York, Sluice Gate for filling Locks. Patented March 19th, 1840.
- Joseph T. Martin*, New-York, Floating Dry Dock. Patented March 19th, 1840.
- John D. Aikin*, Columbus Pa. Rotary Steam Engine. Patented March 19th 1840.
- Reuben Jackson*, Zanesville, Ohio, Cooking Stove. Patented March 19th, 1840.

THE
AMERICAN REPERTORY

OF ARTS, SCIENCES, AND MANUFACTURES.

No. 4.

NEW-YORK, MAY, 1840.

Vol. I.

MACHINE DRAWING AND ITS ADVANTAGES.

In our last number we gave some extracts from Prof. CUMMINGS' lecture on the application of the Arts of Design to the Mechanic Arts, for the purpose of showing their importance as connected with elegance of arrangement, &c. We now propose to show the necessity of the principles of a knowledge of isometrical projection, orthographic drawing, perspective, &c. to enable the machinist to construct with economy and certainty, as to relative strength of parts.

Perhaps this cannot be better shown than by a narration of facts which occurred within the last two years. A friend, having occasion for a steam engine, made out a description, detailing sufficient of the minutiae to receive proposals, and sent copies to several of our largest manufacturers for estimates. On receiving them, to his great surprise, he found their prices to vary as follows: viz. one \$5,700, one \$3,400, one \$2,750, and one \$1,600. He then informed the parties offering the lowest estimate, that they were entitled to the work, but that he feared they had made some error in their estimate of the cost; they showed him a drawing accurately made of all the parts, from which, with the assistance of Tredgold's and other tables, they had decided the relative weight and strength of each part, also the probable cost of each separate piece for finishing, &c. and that they were willing to build it; they did so, and produced an ex-

cellent engine, which has operated successfully ever since; and the cost when completed was found to be within \$40 of the original estimate of the manufacturer, leaving the profit he claimed for his services. Our friend soon after met one of the parties who had estimated at a much higher price, and was asked who built his engine, and at what price; when told, he said (honestly) "they have lost at least \$1000 by it." On being informed that they had made a fair profit, and of the means used to estimate it, he roundly asserted that no man could possibly estimate the weight of each part of an engine by calculation, and acknowledged that he had often both over and under estimated. On being shown how these calculations could be made, and consequently convinced of the fact, he said that he had been twenty years in business, and had never before seen such calculations attempted.

The party who projected the engine had taken twelve lessons in drawing at the Mechanics' Institute, from Mr. P. R. Hodge; and, from a slight application to such abstract mathematical rules as were desirable in his business, had made himself capable of estimating with greater certainty than could be obtained by twenty years experience without such advantages.

By a knowledge of orthographic drawing, the mechanic is enabled to give plans to workmen, so accurate and sufficient, as to do away, in a great degree, with the necessity of his personal presence. An isometrical drawing answers the double purpose of a working drawing and a perspective view, so that the customer and the workman may both be satisfied. A perspective drawing gives a true picture of the machine, as it will exist when finished; which in many cases would secure the work that otherwise would pass to other hands for want of such a picture.

We have often been answered by persons when pressing this subject, *that they had no taste for drawing*; this is a popular error: so far as relates to mechanical drawing, it is entirely a mechanical operation, and may be taught to any person possessing sufficient mind to build a steam engine, in twenty lessons of one hour each. If any of our readers will show a solitary instance of a failure under good instruction, we will freely admit ourselves to

be in error. Add to all these advantages the fact that, with the assistance of a few mechanical books, the inventor may complete his machine on paper, and know to a *certainty* its powers and applicability, without leaving his drawing table; and we are sure none but the stubborn will continue to spend fortunes in experiments which may be definitely decided by a few shillings properly expended.

For the American Repertory.

THE ART OF BUILDING.

BY JAMES FROST.

(CONTINUED.)

No. IV.

Having seen that exceeding light segments of hollow spherical arches, are sufficiently strong to sustain floors and heavy loads, and possess manifold advantages over solid arches, we may assume, that larger segments of similar arches must be much more abundantly sufficient for the purposes of roofs; because the ultimate weight that all segments are capable of supporting, being proportionate to their bases, these larger segments having larger bases, will of course be stronger, and therefore much more than sufficient for the support of roofs; which, unlike floors, have scarcely any load to support beyond their own weight.

In fact we shall find, that hollow spheroidal arches, being incombustible, are impenetrable to heat or cold, of exceeding durability, capable of being formed of any, even of immense magnitude, from valueless materials, easily manufactured; and, although of a texture so light as to be unparalleled in nature or art, yet possessing an ample power of ventilation, as surprising as desirable; hence, then, an amazing economy must result from their application to many useful, important, or magnificent purposes, to which they may be peculiarly or admirably adapted.

The same general remarks may in many cases be extended to other novel forms of arches, of a similar character, hereafter to be described.

Spherical domes, at various times, few and far between, have been used in buildings, more generally for splendor than for utility; hence the useful and economical properties of these and similar arches, remain uninvestigated and unemployed.

Even the spherical figure generally assumed, is practically objectionable, from its tendency (like that of common plain arches) to spring at the haunches; hence, then, in domes expensive bond has been hitherto deemed essential.

But the application of bond in these economical arches is as needless as it is troublesome; it is as extravagant as it is unscientific; for, as nothing can be so desirable as to spare great and useless expense and labor, so nothing can be easier than in this instance to remove the cause for bond and this pernicious tendency of these arches to expand at the haunches; for by commencing the dome at a proper angle with the base thereof, and continuing the dome in the form of an equilibrated spheroid, the tendency to expand and the necessity for bond are both and at once completely annihilated.

As it is most desirable in these researches to obtain a clear apprehension of the great strength and utility of materials when judiciously employed, and to learn how substances, now deemed valueless, may with propriety and economy be substituted for those which are costly; and, as the principal aim of these papers is to advocate such employment, I shall add a note (to avoid interruption) exhibiting the strength of a very inconsiderable and natural spheroid fairly tested, in the expectation it will be considered an instructive as well as curious fact.

Now if we examine the properties of a brick spheroid, similarly proportioned, its thickness one foot. its diameter one hundred and thirty feet, its height sixty-five feet, its weight will be about thirteen hundred tons, and it would sustain, exclusive of its own weight, fifteen thousand tons.

As the only load to which it would be subjected is the force of the wind, which would not exceed one thirtieth its sustaining power, this arch would be as unnecessarily strong as unnecessarily heavy, though light beyond example.

And such a building as any solid arch could afford without further precaution, though so over strong to support weight,

would not in this climate be useful, from the extreme variation of temperature within the building.

For of all required good qualities in a building, the prime, the essential object to be sought for, is imperviousness to heat or cold; and happily this most important object may be attained in a singularly easy manner, by the use of much less material of an improved form—by the substitution for this single solid arch, (which would readily conduct heat or cold,) of a hollow arch of double its thickness, but formed of double or triple thin walls at suitable intervals (the inner walls being tubular or hollow) and properly connected by occasional hollow bonding courses, according with the size and quality of the building.

The peculiar value and strength of these arches of double curvature being derived from their form, and their stiffness, or power of retaining their form, increasing in the ratio of their thickness; their strength will thus be increased to the utmost, and at the same time the arches be rendered perfectly impervious to heat or cold. Thus perfection will be obtained with the least possible expenditure of materials of an inexpensive kind; and as these arches require no large centering, (an advantage possessed by no others) but, on the contrary, serving the double purpose of walls and roofs, are susceptible (by a few ingenious appliances) of receiving great and elegant internal embellishment at little cost; thus affording the strongest, lightest, cheapest, and, if required, the most ornamental and magnificent of all unflammable and economical structures for many private and public purposes.

We cannot help being assured of this economy, by comparing the cost of such an arch with one of the latest modern similar works, the central roof of the Hal au Blé, or grain market, in Paris; the circular inner court of which, 120 French feet, in diameter 131.23 feet, was covered very ingeniously with wood in 1782; was burned in 1802; was roofed in 1812 with a tinned copper hemispherical covering, supported on iron ribs; the weight of metals 280.2 tons, the expense \$167,600.

Now a treble hollow hemispherical arch weighing less than 600 tons, would support more than 10,000 tons, and though costing less than one tenth of the expense of the Parisian,

would be vastly more intrinsically valuable, because it would be as perfect a nonconductor of heat or cold, as the other is a perfect conductor; thence an oven in summer, and an ice house in winter, ever uncomfortable in all seasons.

A peculiar and novel advantage in these arches is the unparalleled degree and superior quality of ventilation they will afford without cost or trouble, and with the further recommendation, of being most effectual when most wanted, in the hottest weather. This will become apparent by considering the great space between the external and middle wall, on that side of the building exposed to the sun, as a vast reservoir of heated and rarefied air, having an immense tendency to ascend and to escape from numerous apertures, provided for that purpose externally at the upper part of arch. A continued large stream of air being thus discharged, a corresponding quantity will be exhausted from the interior of the building, through numerous small valves for its regulated emission.

Thus a large volume of heated air being continually expelled by an ascending current within the heated side of the building, a descending current of cool, dry, and pure air will be induced to enter from the shady and cool side of the building (and the coolest, purest, and driest air is always found at considerable altitudes) to supply the interior of the building, instead of the less pure, warmer, and more moist air, as usually admitted.

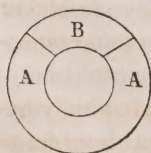
Other methods have been pursued to obtain similar results, with what inferior success may be seen, by a comparison of some of the best, as in the Derby hospital, in which fresh air is obtained in warm weather through a long and large underground archway. This in some situations would be noxious, in all inefficacious when much used; for the archway would become warm, and incapable of fulfilling its object when most wanted; hence, air of certain dampness, uncertain purity, and inferior coolness, would be furnished at a certain expense, and inconsiderable quantity, because the exhausting power is feeble or wanting, and the cooling power partial, ineffective, and objectionable.

I have dwelt on this subject fully, because I emphatically believe it would be found practically of immense advantage, to

the inhabitants of hot countries to have their dwellings constructed with hollow walls, and also, all such other buildings as require a cool interior; and by proper arrangements, easily apprehended, by employing the ascending current of air heated within those walls exposed to the sun, to exhaust the air from within the building, and thus inhale from the walls on the shady side of building, the cool and salubrious air floating near the highest parts thereof, whence an ample supply may be procured in a refreshing and luxurious breeze, an advantage and enjoyment hitherto unobtained, and unanticipated; overlooked and therefore unattempted.

Now, a most singular recommendation of this method consists in its economy, for hollow walls will be always as inexpensive as solid walls and frequently more so; and thus sometimes a saving in construction, will accompany the double advantage of intercepting the transmission of heat, and of exhausting and exchanging heated and impure air, for cool and pure air, with a force and celerity, in proportion to its intensity and impurity; and as hollow walls will as effectually prevent the transmission of cold as well as of heat, their general substitution for solid walls, must in innumerable cases, when combined with hollow floors and roofs, be attended with such an equalized temperature as cannot fail to be of infinite advantage to comfort and health, as well as general security against conflagration.

On the construction of hollow walls, I have many important practical observations to remark, and many improvements to notice, on a future occasion; at present we must proceed with our subject, by considering another kind of hollow arch of double curvature, and of the lightest form imaginable, and which will serve the double purposes of walls and roofs, and thus furnish exceedingly inexpensive and incombustible structures, which their great simplicity and easy formation will recommend for many useful and economical purposes.



The plan of these consists essentially of a circular ring A, A, open at the centre (or the centre may be covered with a dome,) or of any portion of circular ring, as B, cut by the radius; and, if so cut, the ends furnished with perpendicular walls.

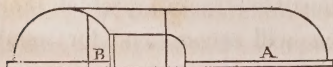
Then if an equilibrated arch, or portion thereof, be built on this circular ring, and forming what is technically termed a circular circular ring, the double curvature thus produced will give ample stiffness to insure the permanence of the arch; even if it be so slight as not to be able to stand alone were it built straight.

Although this kind of arch must be built upon a centre, yet little expense will be thereby incurred; as the arch is so strong from its form, that a small portion may be built at a time on a short centre, which being removed, this small centre will serve to support a large arch or numerous arches in succession.

As buildings of this form may be built with very light tubes or hollow bricks; as such tubes or bricks may be made as inexpensive as common bricks; as hollow arches are as easy of construction as solid arches, and stronger in proportion to the quantity of materials therein; it follows from these data, that temperate, incombustible, and durable buildings may be obtained as cheaply, and constructed as easily, as intemperate, combustible, and perishable fabrics.

As a full proof that lightness of structure is dependent on skill; that durability is compatible with true economy; that strength depends more on the proper selection and judicious application of materials, than upon their weight or quantity; I have only to adduce and to describe a roof formed of glass and iron, of exceeding beauty, of this peculiar form, in the Surrey Zoological Gardens, London, which exhibits such a perfect combination of strength with lightness, of elegance with inexpensiveness, of utility with durability, as to show most convincingly, how extremely materials may be economized, with good effect and liberality of purpose.

This roof, is about three hundred feet in circumference; the



width of ring about twenty five feet, shown in front at A, in section at B, is wholly roofed with

small curved ribs of rolled iron, standing vertically about six inches asunder at the base, and three inches at the top, resting on a low wall in front, upon a high wall in rear, connected horizontally by a few stout iron wire tye rods, glazed with very small panes, each of an elegant segmental form, cut from frag-

ments of glass of little cost, firmly cemented to bars and to each other by overlapping barely one eighth of an inch. They form, with the bars, altogether a firm arch of double curvature, capable of resisting the violence of the wind, impervious to rain, constituting the most commodious, agreeable, and light building imaginable for the protection and display of a splendid collection of wild animals; but adduced here only as evidence of the extreme lightness of structure of an arch of double curvature, for a permanent and extensive building, and as a means of showing what important improvements have yet to be effected in an art, which many who practise complacently assume as all but perfect.

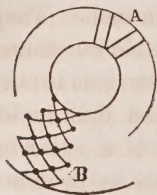
 The accompanying section of the arched bars of rolled iron is of the full size; and hence this immense roof of glass and iron may be assumed of the weight only of about three pounds, per suppl. foot, or less absolute weight than of the slightest shingled, wooden, commonest shed.

A moment's consideration of this fact, in a comparison of the weight and cost of this permanent arch of double curvature, with the weight and cost of any arch of single curvature, must convince every ingenuous person of the infinite superiority of the strength of such forms, and of the secure, profitable, and happy results to be practically obtained by their adoption.

It is as possible to form a straight as a circular building of moderate width, possessing all the advantages of the circular hollow equilibrated arches before detailed, with one small exception and precaution only, viz. the additional expense of small internal or external ribs at suitable distances, to give sufficient stiffness to insure the stability of the arches, with which these ribs, being properly bonded, will form a firm, sound, and unyielding fabric. Thus, another extensive form, a distinct series of novel, useful, and cheap, incombustible buildings, becomes attainable for a multitude of useful purposes.

Series of connected plain arches, adapted to incombustible buildings, surrounding a complete circle, but little known, though sometimes adopted in practice, are deserving of attention, as in some cases they may be advantageously employed alone,

as they have been in some considerable works, in the coast defences of England, arched on walls at A, or in conjunction with a circular covered central roof, with groined arches on pillars, as at B, in the Hal au Blé at Paris, as already described ; and, as by continuing the series of arches round the entire circle, the arches abut against each other ;



and as they may be constructed of any number of stories or floors of arches ; and as the upper arches may be covered with slate or composition for roofs, or covered with gravel for a terrace, and as the exterior circular walls will not be required of any particular thickness, this form may be (connected or not with the central dome) employed for many useful purposes of storage, as at Paris, where it forms an extensive series of granaries of the most useful kind. In fact a combination of the circular ring and dome, the ring and dome where meeting supported on a wall, circular on the plan, pierced with large arched apertures, as well as other combinations of these different kinds of buildings, will present themselves in a variety of useful forms to any reflecting and intelligent person.

The rough sketch here attempted, requires much filling up, to be adequate to the purposes intended, of indicating that radical improvement, so immeasurably needed, of one of the most useful arts ; and which in its present imperfect condition, is the constant and fruitful source of some of the greatest calamities that afflict and impoverish society. Yet, imperfect as such a confined sketch must necessarily be, in a work devoted and limited to general notices of improvement, I trust to have satisfactorily removed the greatest objections hitherto made to incombustible buildings, by showing that neither enormous sacrifice of space, nor cumbersome walls and arches, nor extravagant cost, is needed ; and that all the complicated evils attendant on combustible structures may be easily overcome and at no very remote period be annihilated, while in numerous cases, great immediate profit must result. Perhaps there are few situations wherein incombustible buildings may not be found profitable, and in some instances extremely so as will appear from the following fact.

A merchant has to insure a valuable incombustible stock (and his new fire proof, combustible store) at an annual expense of one thousand dollars; and as the extra cost of a durable and incombustible store would not have exceeded two thousand dollars, and as unflammable merchandise therein needed no insurance; the saving of the merchant in the first year's cost of his store will be much less than one thousand dollars because he has also been at some considerable expense for that puerile contrivance, a fire proof safe; whence the loss of the merchant will evidently be equal to the difference between the trifling sum saved, and the tax of one thousand dollars yearly, besides the certain losses, crosses, and contingencies attending a future conflagration, against which no insurance ever did or can provide.

ANALYSIS OF SOILS.

BY C. A. LEE, M. D.

In a late "Report on a re-examination of Massachusetts," by Professor Hitchcock, we have noticed an account of a new mode of analysing soils, which is so simple and important, that we are induced to transfer it to our pages. It is the invention of Dr. SAMUEL L. DANA, of Lowell, Mass.

RULES OF ANALYSIS.

1. "Sift the soil through a fine sieve. Take the fine part, *bake* it just up to browning paper.

2. "Boil one hundred grains of the baked soil with fifty grains of pearl ashes, saleratus, or carbonate of soda, in four ounces of water, for half an hour; let it settle; decant the clear; wash the grounds with four ounces of boiling water; throw all on a weighed filter, previously dried at the same temperature as was the soil; wash till colorless water returns; mix all these liquors. It is a brown colored solution of all the soluble *geine*. All sulphates have been converted into carbonates, and, with any phosphates, are on the filter. Dry, therefore, that, with its contents, at the same heat as before. Weigh—the loss is soluble *geine*.

3. "If you wish to examine the geine, precipitate the alkaline solution with excess of lime water. The *geate* of lime will rapidly subside, and if lime water enough has been added, the nitrous liquor will be colorless. Collect the *geate* of lime on a filter; wash with a little acetic or very dilute muriatic acid, and you have geine quite pure. Dry and weigh.

4. "Replace on a funnel the filter and its earthy contents, wash with two drams muriatic acid diluted with three times its bulk of cold water. Wash till tasteless. The carbonate and phosphate of lime will be dissolved with a little iron, which has resulted from the decomposition of any salts of iron, besides a little oxide of iron. The alumine will be scarcely touched. We may estimate all as *salts* of lime. Evaporate the muriatic solution to dryness, weigh and dissolve in boiling water. The insoluble will be *phosphate of lime*. Weigh—the loss is the *sulphate of lime*; (I make no allowance here for the difference in atomic weights of the acids, as the result is of no consequence in this analysis.)

5. "The earthy residuums, if of a greyish white color, contain no insoluble geine; test it by burning a weighed small quantity on a hot shovel. If the odor of burning peat is given off, the presence of insoluble geine is indicated. If so, *calcine* the earthy residuum and its filter—the loss of weight will give the insoluble geine; that part which air and moisture, time and lime, will convert into soluble vegetable food. Any error here will be due to the loss of water in a hydrate, if one be present, but these exist in too small quantities in 'granitic sand' to affect the result. The actual weight of the residuary mass is 'granitic sand,' 'the clay, mica, quartz, &c. are easily distinguished. If your soil is calcareous, which may be easily tested by acids; then before proceeding to this analysis, boil one hundred grains in a pint of water, filter and dry as before; the loss of weight is due to the *sulphate of lime*, even the sulphate of iron may be so considered; for the ultimate result in cultivation is to convert this into sulphate of lime."

"Test the soil with muriatic acid, and having thus removed the lime, proceed as before, to determine the geine and insoluble vegetable matter.

Prof. Hitchcock remarks, in a note, as follows: "in applying Dr. Dana's rules given in the text, to the soils of Massachusetts, I found it necessary to adopt some method of carrying forward several processes together. I accordingly made ten compartments upon a table, each provided with apparatus for filtering and precipitations, also ten numbered flasks, ten evaporating dishes, and a piece of sheet iron pierced with ten holes, for receiving the same number of crucibles. I provided also, a sheet iron oven, with a tin bottom large enough to admit ten filters, arranged in proper order, and a hole in the top to admit a thermometer. The sand bath was also made large enough for receiving ten flasks. In this manner I was able to conduct ten processes with almost as great facility as one could have been carried forward in the usual way."

We have no hesitation in commending this report of Prof. Hitchcock, as one of the most valuable which has yet appeared in any country.

L.

NEW THEORY OF VISION.

BY DR. WALLACE, OCULIST, N. Y.

From the experiments of Morichini of Rome, and Mrs. Somerville of London, we learn that violet and green light possess the property of rendering steel magnetic, while no effect is produced by yellow or red. If we consider the former colors positive and the latter negative, and if, as Sir John Herschel supposes, there are a number of minute fibres placed at right angles to the coarser fibres of the retina, as the pile of velvet rises from the coarser texture of the woven silk—an opinion which he expressed not long ago in a letter to me—we may easily conceive that the impressions on the retina may be conveyed through the bundles of the optic nerve to the sensorium, on the principle of the electro-magnetic telegraph.

This theory derives plausibility from the fact, that the spectrum, which remains after looking at a bright object, is always of an opposite color; and from some ingenious experiments made by Mr. Newberry, a scientific teacher of drawing, in this city. When light is admitted through blue glass and received

upon a sheet of white paper, the object held before the paper, is yellow. When it is admitted through yellow glass the shadow is blue ; when the glass is red the shadow is green ; and when green the shadow is red. The shadows of a landscape have a purple hue during a summer's sunset when the sky is yellow.

The brain itself is an electro-magnetic instrument, consisting of a brown and of a white plate convoluted in such a manner that with a great extent of surface they are packed in a very narrow compass. From the white plate proceed numerous conductors twisted round the base, not at all dissimilar to the arrangement of one of Henry's magnets. See Tiedemann's and Spurzheim's plates.

As motion can be effected by transmitting galvanic currents along the nerves which proceed from the brain, there is reason to believe that sensation is produced by similar currents passing to the brain, and that these currents are always changing with the nature of the impression. If the minute fibres of the retina are made positive by blue light, a positive effect will be immediately made at their termination in the brain. If yellow light be then presented, the fibres being negatively affected will assume a different position and thus alter their terminations. All the other colors may produce similar effects, and may be conveyed by their own peculiar fibre contained in the bundles of which the nerve is composed.

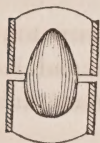
SURPRISING STRENGTH OF AN EGG SHELL.

In Lord Brougham's celebrated discourse, on the objects, pleasures, and advantages of science, an interesting description occurs, of the mathematical accuracy and perfect economy exhibited by the bee in the construction of a honeycomb, and showing how superior in those respects are the works of that little insect, to the works of the sons of Adam.

The same exquisite adaptation of means to ends, as superior exhibition of great strength obtained from the least material, is also constantly exhibited for our instruction in those beautiful productions of providence, the shells of various animals, and which, however different their forms, will always be found com-

posed of curves of double curvature, and the great strength of a very fragile and brittle substance of this form, is well exhibited in the shell of a common egg.

These shells vary in weight from ninety to one hundred and ten grains. One, weighing one hundred and four grains, was embedded in plaster, within two copper hoops, which with the plaster were at the distance of one tenth of an inch; pressure being gradually applied by a weighted lever, the shell sustained uninjured seven hundred pounds. Now, as the diameter was $1\frac{5}{8}$ inch, the thickness $\frac{1}{80}$ of an inch, the area subjected to pressure was $\frac{1}{16}$ of an inch, = 11200 lbs. per square inch, (supported.) The specific gravity of common egg shell is 2.444.



Brick, specific gravity, 1.841	} According to Rennie,	is crushed with	562 lbs.
Marble, “ “ 2.706		“ “	6,060
Granite, “ “ 2.625		“ “	10,910

Egg shell consists of a considerable portion of Albumen;

“ “	Silica, a trace;
“ “	Carbonate of Lime, about 2;
“ “	Carbonate of Magnesia, about 1.

The lime having been precipitated by oxalate ammonia, the solution did not become turbid by addition of ammonia; hence, as a copious precipitate of magnesia followed a drop of phosphoric acid, it seems improbable that phosphoric acid was previously present in the shell, as usually stated in chemical works.

The hardness of Italian statuary marble, as tested by abrasion, being..... 100

The hardness of the external parts of shells, similarly tested, varied from 400 to 450,....average, 425

The hardness of the internal portion of the shell is much less, but yet considerable. If into a shell broken in the direction of its conjugate diameter, another shell be inserted, it will be found to fit accurately in every position; proving the perfect circular figure of each, a mechanical fact truly surprising, when the formation of shell from a fluid within the interior of an animal in frequent motion is considered. It exhibits another proof of the wonderful superiority of the ways of providence above our ways on all occasions.

For the American Repertory.

LYCEUM OF NATURAL HISTORY.

PROCEEDINGS.

April. Dr. Jay presented two nuts of a palm allied to the cocoa nut.

Dr. De Kay, exhibited a flounder, in which, contrary to the general case, the eyes were placed on the left side, and both sides were deeply colored. It was considered a remarkable example not only of a doubled, but reversed fish.

Mr. W. Kemble presented, through Mr. W. C. Redfield, a piece of shale, containing several fossil fish, taken from a coal pit near Richmond, Va.

Dr. Torrey exhibited specimens of both the red and white coonti or arrow root used by the Indians of Florida for food. The latter is prepared from the underground stem of the *Zamia integrifolia*, and the former from a species of *Smilax*.

Capt. Folkes, of the ship *Bertha*, presented the eggs of a land shell, (*Bulimus ovatus*) common in the vicinity of Rio Janeiro. These eggs were laid on board his ship in November 1836, while on the passage to Germany, whither he was taking the shells, to satisfy the naturalists of Europe of the fact of their laying eggs.

Dr. Boyd stated that he had detected our common snail, the *Helix alternata*, in the act of depositing its eggs, and that he had broken the egg and found the young shell inside.

Mr. W. C. Redfield exhibited two charts illustrating the progress of Atlantic hurricanes; prepared by Lieut. Reed of the British Navy.

The President made an interesting statement relative to the discovery of Silica, in an organized state, in the ashes of plants, by Mr. B. Reade. He also stated that he had found silicious skeletons in the ashes of anthracite coal.

Prof. Bailey of West Point exhibited drawings of silicious skeletons, which he had obtained from the ashes of some *confervæ*.

The fourth geological report of the state of Tennessee, and the second report of Maine were laid before the society.

Mr. J. H. Redfield presented the palatine teeth of a species of fossil shark, from the carboniferous limestone of Bristol Eng.

A communication was read from John G. Anthony relative to some trilobites found in the vicinity of Cincinnati, Ohio, which exhibited distinct traces of antennæ. Some fine specimens of chrystalized gypsum were received from Mr. Joseph H. Applegate.

Dr. De Kay presented a piece of sulphuret of copper, in mica slate from North Carolina. He also laid before the society specimens of tin ore; which he had received from the same gentleman from whom were obtained the specimens presented in October last, and who stated that they were procured from the mountains of North Carolina.

A fine coralline, (*Fungia*) from the East Indies was presented by R. P. Jenks, Esq.

Dr. Gale informed the society that he had recently examined the lignite beds of Amboy, and found several of them under water at the distance of forty or fifty rods from the shore. He also found in the water at some distance below low water mark, several stumps of charred wood, apparently of more recent date than the other deposits.

Dr. Jay presented some very perfect crystals of hornblende and sulphuret of copper, from the East Indies; also, a cast in wax from a specimen of a new genus of trilobites, with a communication from J. G. Anthony, Esq. describing this and another species of the same genus for which the name *Ceratocephala* is proposed.

The Transylvanian Journal of Medicine and Science, vol. 8, and a number of pamphlets, were received from Dr. C. W. Shorp, of Lexington, Kentucky.

The President read a communication from Professor Baillie, of West Point, reporting the existence of a large deposit of fossil infusoria in a peat bog near Fort Putnam, West Point, and describing the same. The paper was accompanied with specimens for the society.

The President stated, that these infusoria were similar, and some of them identical, with the species described by Ehren-

berg in Silesia, and which are found to make up almost the entire substance of the mineral called Tripoli or polishing slate.

Mr. Russell presented specimens of lead ore from the Shawangunk Mountains.

GENERAL SOCIETY OF MECHANICS AND TRADESMEN.

In our last we gave a brief summary of the pecuniary benefits conferred by the society upon the families of its members; and we then adverted to other subjects upon which we had then neither room nor leisure to touch. Among these were the valuable library and the schools of the society; subjects, indeed of immense consequence, since they must very materially influence the principles, the acquirements, and the future fortunes of those who have opportunity to avail themselves of such advantages. We therefore now subjoin briefly from the late reports, the condition and prospects of these two valuable departments.

LIBRARY. At the commencement of the present year, there were the following amounts of books in the library; all or most of which have been selected with anxious care, as adapted for the practical use of the apprentice and student, in the wide range of Mechanic Arts.

Volumes in folio,	- - - - -	90
“ quarto,	- - - - -	193
“ octavo,	- - - - -	2669
“ duodecimo,	- - - - -	8107
Total,		<u>11,059</u>

That these volumes have not remained “sealed books,” in the hands of the librarian, may be gathered from the pleasing fact that there are 1864 readers; and that during the course of the year 1839, these readers have taken out of the library no fewer than 42,037 volumes, for perusal, being an average of more than $22\frac{1}{2}$ volumes each, and being likewise an increase over the preceding year, of 5167 volumes. The expense of this department for the year 1839, has been \$1230 70.

Now when we consider how small a portion of time young mechanics have in their power to devote to reading, after going through their daily occupations, and taking the necessary re-

flection and recreation, it is truly admirable to note the impulse that has been given to useful inquiry, and the patient perseverance with which these young persons have pursued the search for information. Two or three and twenty volumes of useful matter, well digested in the mind, furnish not only a large annual acquisition of knowledge *directly*, but they lay the foundation for a still larger amount of inquiry, the ramifications of which we cannot trace, but they *must be* for good in the main.

SCHOOLS. The summary view of this department for the year 1839, must be pleasing to every friend of humanity and lover of cultivated intellect. The report states that, in the past year

The whole number of male pupils was.....	279
Average attendance during the year.....	245
The whole number of female pupils.....	240
Average attendance.....	220
	519 465

Of this number 70 are educated gratuitously, the remainder pay at a low fixed rate, as we have formerly described. In the two departments there are seventeen teachers employed, and the total expense of the schools during the past year has been \$10,538 33.

We need scarcely express the pleasure we shall have in following up such statistics as these, whenever we shall have opportunity.

We cannot on this occasion, refuse the tribute of admiration to a sister institution, the Mercantile Library Association, reflecting as we do on the conduct of so large a portion of the young **men** of our city, who, disdaining the idle and mischievous dissipation incidental to a large and metropolitan emporium, voluntarily collect themselves into a society, establish sage laws for its government, supply themselves with an extensive library and reading rooms, form valuable lectures for their general improvement during the long evenings of winter, form classes among themselves for the enlargement of scientific knowledge; and all this in the very teeth of incitements continually before

them, which only their own will and sound judgment resist, and in many of which they might participate without being exposed to the animadversion of the world. This institution is indeed, one of which any city in the world might be proud.

[For the American Repertory.]

NATIONAL ACADEMY OF DESIGN.

A meeting of the council was held Monday evening, March 16th, at the rooms of the institution, Clinton Hall, for the purpose of deciding on the merits of the drawings offered for the premiums in the "Life" and "Antique" Schools, and for distributing the rewards to the successful students.

After the decisions were made, the president in council offered a few complimentary remarks, on the gradual improvement manifested by the students, and the benefits arising therefrom, through the influence of the schools, and concluded by requesting, as a mark of approbation, that the drawings which obtained the premiums be placed in the rooms of the Academy during the ensuing year; after which the result was made known, and the premiums awarded in the usual manner, as follows:

In the Life School.—The large silver palette for the best drawing in black and white chalk from the "living" model, to Mr. Jeremiah Nims.

The small silver palette, in the same class, for the second best drawing in black and white chalk from the "living" model, to Mr. S. R. Fanshaw.

In the Antique School.—The large silver palette for the best drawing in black and white chalk from the Venus de Medicis, to Mr. W. J. Bolton.

The small silver palette, in the same class, for the best drawing in black and white chalk, from Hudson's anatomical figure, to Mr. F. E. Jones.

C.

[For the American Repertory]

MECHANICS' INSTITUTE.

CONVERSATIONAL MEETING.

Subject—*Iron Ships*. Many interesting facts were stated in relation to the subject before the meeting. In Great Britain and on the continent, public attention seems to be rapidly awakening to the importance of this species of naval architecture. In England especially, quite a number of iron ships have been constructed, and of various sizes and tonnage. The largest ship of this material, hitherto attempted, is now building at Bristol, Eng. by the Great Western Steam Company. "This vessel is to be three hundred feet long by about forty-five feet wide, and thirty deep. Her keel plate is one inch iron, and the others of five eighths, with double rows of rivets. The ribs are of angle iron, rolled on purpose, and are placed at eighteen inches apart. She will have a very beautiful bow. Her midship section is on the French principle laid down in 1790 by Romné."

"The cylinders of the engines are to be of one hundred and ten inches diameter, and eight feet six inches stroke. Each engine of five hundred horse power. The boilers are made in three parts." [Lond. Mech. Mag. Feb. 1840.]

In England the comparative cost of iron ships is less than those of wood; and it was stated that, for an iron steam boat built by the West Point Foundry Association in this city in 1838, the additional charge over and above an estimate for building the boat in England, was only so much as it would have cost the owners to get the hull from thence into our waters. This boat was 110 feet long and 22 feet beam; the ribs were of wrought iron, made the full length and bent to models. She was covered with rolled iron of five thicknesses to the inch; the fore and aft seams were lapped; the thwart-ship seams were butted and double riveted to the ribs. The work was mostly performed by boiler makers, and although with the use of some additional machinery to that required for engine boilers, yet not necessarily so. The Association is ready to take a contract for building a boat of any required size.

Iron steam boats are much to be preferred for navigating the

Mississippi and the rivers emptying into it. The snags, sawyers, bars, and other impediments to the safe navigation of these waters, are almost harmless to an iron hull. And *all* danger to *life* from these causes may be avoided, by an easy division of the hull into water tight compartments, as in the case of the Valley Forge, an iron vessel now navigating the Ohio. Even should the hull of such a vessel be penetrated by a snag, the division broken into would be the only one affected.

Ships constructed of iron are less liable to suffer from the ordinary perils of the ocean; their seams are not so likely to start while laboring in a gale; vermin, those sometimes formidable occupants of a vessel, can do no injury to the hull; even a lee shore, commonly so much an object of dread to the sailor, loses part of its terrors when encountered by an iron vessel. It was stated that the two steamboats, one built of iron, the other of wood, taken out by the Landers in their last expedition to Africa, encountered on the passage to the coast a thunderstorm, and that they were very differently affected by the electric fluid; the wooden vessel was struck three times by lightning and much injured, while the iron vessel did not receive the slightest damage.

It was supposed that iron vessels would be preferable for the navy. First, because they are, as sailors call it, *limber*, that is, possess a lithe or pliant property that adds to the speed of a vessel; and again it was alleged that a ball striking the hull from any direction oblique to the surface would be likely to glance from it.

"There is now lying at Greenock (Scotland) a very beautiful iron steamer bearing the name of "*Nemesis*." She is fitted up with one engine of 120 horse power, and armed with two 32-pound carronades, the one fore and the other aft, which move on solid swivel carriages. Her draught of water is under four feet. Her crew will consist of 40 men. She will, it is said, clear out for Brazil, but her ultimate destination is conjectured to be the eastern and Chinese seas."—*Edin. Obs.*

In answer to a question as to the effect of an iron hull upon the compass, a member stated that a method was known and used in England, for obviating any difficulty which might arise from that cause, but it had not yet been made public.

IRON SHIPS.

JAMES J. MAPES,

New-York, March 24th, 1840.

SIR: In compliance with your request, I give you below a statement of such facts, as have come to my knowledge connected with the use of iron boats in this country.

I think it is now about six years since the first iron steam boat was imported from England by a steam boat company at Savannah. This boat was fitted together in England, and sent out in pieces, the necessary tools and workmen being sent with it, to set it up and put it in operation, which was done at Savannah. Subsequently to this, the Savannah Co. imported and put in operation in the same way, one or two other iron boats.

The last iron boats, imported in sections, were two brought out last year for a company in or near Savannah, and were set up and put in operation at Baltimore, not however by workmen sent from England, but by Messrs. Watchman & Bratt, of Baltimore, the engines for the boats being also built by them.

There was also an iron boat imported into New Orleans last year. This I think was a canal boat to ply on the New Orleans and Pontchartrain canal.

The Robert F. Stockton, whose recent daring passage of the Atlantic has made her so well known, is an iron boat, 70 ft. length, 10 feet beam, and moved by Erickson's Patent Propeller. She is of 30 tons burden, and was intended to ply on the Delaware and Raritan canal, but was I believe found to draw too much water for this purpose. She is now in use on the Delaware river as a tug.

The first iron boats wholly constructed in this country, were built in the western part of this state in the year 1835 or 36, for an opposition line of packet boats on the Erie canal, between Rochester and Buffalo; and as they had a less draft of water than the wooden packet boats, they were enabled to beat the latter from one to four hours in running the whole distance.

The next boats built here, of iron, were those used by the Transportation Lines between Philadelphia and Pittsburg, in 1837. They were built very light for plying on canals only, and were in several distinct sections; which sections were so

made, that when connected, they formed a complete boat; and when the boat arrived at the junction of the canal and railroad, each section was hoisted up, together with the merchandise it contained to a railway carriage, and transported across the mountains, and again replaced in the canal. In this way none of the freight was disturbed until it had arrived at its destination.

Some of the boats built for this route were whole, and not in sections, as above described.

In the summer and fall of 1838, an iron steam boat, with engines, cabins, &c. complete, was built in New-York by the West Point Foundry Association.

This was a twin boat, of 110 feet in length and 23 feet beam, each boat being 7 feet beam. All the rib, angle, and plate iron, was rolled to order at the Ulster Iron Works, and the boat was riveted together complete in New-York, except in four of the thwart-ship seams, which were left unriveted, so as be able to send it out to New Orleans, (for which place it was built) on board ship.

The engines were two, of 14 horse power each, with two cylindrical flue boilers. By the contract entered into on the part of the West Point Foundry Association, the draft of water was guaranteed, with wood, water, and passengers on board, not to exceed 24 inches; and the speed to be equal to 9 miles per hour. When the boat was put in operation, the draft of water was found to be, with wood, water, and passengers on board, 22 inches, and the speed between 11 and $11\frac{1}{2}$ miles per hour. This boat was to ply as a mail and passenger boat on the canal between New Orleans and Lake Pontchartrain.

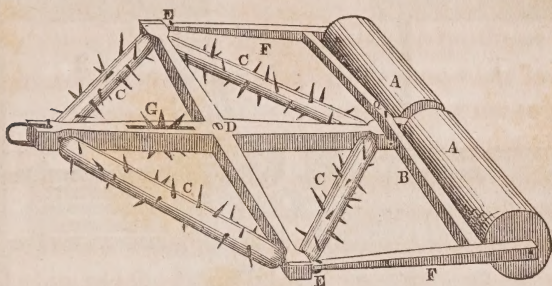
The last and largest iron boat built in this country was built at Pittsburg in the summer of 1839: it was called the Valley Forge, and commenced running on the Ohio and Mississippi rivers in the fall of the same year, and has proved upon trial perfectly snag proof. The tonnage of this boat is from 300 to 400 tons.

With the hope that this brief description will be of *some* service in calling attention to a subject whose importance has long since ceased to be doubted by practical engineers.

I remain, yours, respectfully,

C. W. C.

Report of the Committee on Arts and Sciences, of the Mechanics' Institute, on the Revolving Diagonal Harrow, by MOSES G. CASS, Utica, N. Y.



C, C, C, C, are revolving cylinders working in the frame D, by means of gudgeons placed in the ends. Each cylinder is charged with teeth placed perpendicular to the axis, as seen in the drawing. G is a toothed wheel intended to break up the ground that would otherwise be passed over untouched; being under the lengthwise rail of the harrow. B, E, F, a moveable frame supporting the rollers A, A, which may be attached to or disconnected from the harrow at pleasure.

An examination of this machine, and a little reflection will serve to show its superiority to the ordinary harrow. In its passage over the ground the teeth enter the earth in all directions, breaking, removing, or tearing up all slight obstructions; while if it meet with a large stone or any obstacle that would throw the common harrow out, the cylinder, which in this machine encounters the obstruction, is enabled by a whole or partial revolution to pass over it.

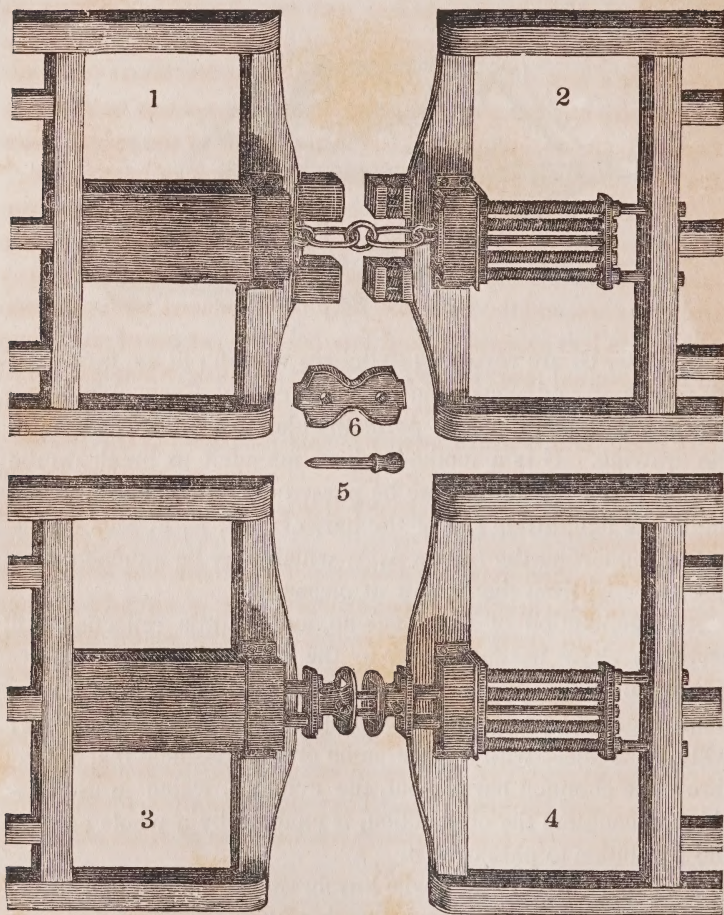
An experienced farmer, who has for some time had one of Mr. Cass's harrows in use, remarks that "by attaching the seed sower and rollers, a most perfect finishing operation will be performed, and at a saving of one half if not three fourths of the labor commonly required to do the same work."

All which is respectfully submitted.

WILLIAM A. COX, *Chairman.*

Mechanics' Institute, February 18th, 1840

P. ALVERSON'S PATENT SPIRAL SPRING DRAFT FOR RAILROAD CARS.



The object of this invention is to prevent the jerk usually experienced on the first movement of connected cars, and the shock occasioned by the concussion when suddenly stopped. It consists in interposing elastic chains or spiral spring drafts on the front and rear of each car connected with others in the train.

The drawings at the head of this notice represent the action of the springs in two modes. When used with one bumper,

which the inventor prefers, the drafts are made to operate each way, to soften the jerk of the forward motion, and also by reaction to check the recoil. Figures 1 and 2, represent the first plan, with hooks, chains, and two bumpers. The rods and springs are shown on one frame, and on the other enclosed in a box. Figures 3 and 4 represent the latest improvement, with one bumper operating upon the springs each way; cars in both cases at rest. The elastic chains of the several cars may be attached to each other by a single link or bar of iron.

Mr. Alverson, in speaking of his invention, says "the advantages resulting from these last improvements are that the elastic or spring draft is made to operate easily with a light or heavy train of cars, and the bumpers may be dispensed with; the machinery is less expensive, and less liable to get out of order than in any method now in use, and costs but little when compared with its advantages; the operation is steadier, is attended with less noise, and is much more pleasant for passengers; the cars are less liable to injury, and the locomotive is assisted by the spring draft in starting a heavy train, and also while running on the road."

This invention may be easily applied to cars and locomotive tenders of all varieties of construction. It is already in very extensive use upon different railroads in the south and west, and has even been adopted on some of the Austrian and Russian railroads. Mr. Alverson, who by the way is a resident of New Haven, Conn. informed us in his last communication upon the subject, that he was fitting up some for the New-York and Harlaem Railroad Co. They are doubtless by this time in use, and may be seen by any one desirous of witnessing fully their operation.

INDICATOR OF THE LEVEL OF WATER IN BOILERS.

This is a new application of an apparatus familiar to most engineers. It has occasionally been attached to the supply cock of a steam boiler, to render it a self-feeding one, but the difficulties which lie in the way of its use for that purpose, have caused it to be abandoned.

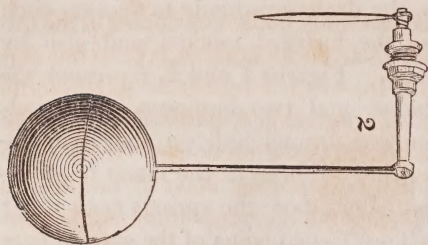


Fig. 2, represents the entire apparatus; a hollow ball of copper, air tight, attached to an arm passing through the head of the boiler; this arm having on its exterior end an index, that by pass-

ing over a graduated plate indicates the quantity of water in the boiler.

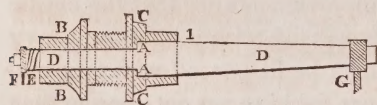


Fig. 1 is a cut section of the arm and its connections. D, the arm, passes through a case

B, inserted in the boiler head; this case is secured and the joint made steam-tight by means of the nut C. The arm within the case has a shoulder ground to a face, A, A, forming a valve which is kept perfectly tight by the action of the spiral spring E. G, is the connection of the ball with the arm. F, that of the arm with the index.

This instrument is for sale by CHARLES W. JEWELL, No. 134 West street, New-York.

LECTURES AT THE MECHANICS' INSTITUTE.

We proceed to notice another of the lectures which have been given at the Mechanics' Institute; it was given by Mr. A. D. Paterson of this city, and as connected with commerce, the support of America's Independence and of her national dignity, it may be worthy of the attention of our readers. The subject was "the origin, progress, and present state of Geography," a theme capable of great extension, and in fact, being from that cause, divided into two parts, we cannot give more than a summary notice of the points brought under consideration.

The lecturer commenced by pointing out that Astronomy was antecedent to Geography, as a study of mankind, and he accounted for it from at least two remarkable causes, the one the result of leisure, the other of necessity. Thus the early nomadic state of mankind on the plains of Chaldea and Mesopota-

mia, induced attention to the heavenly bodies, as guides in the migrations of those people with their flocks and herds from one fertile spot to another, and as helps to their return to any favorite sojourn. They were, by this assistance, particularly by the pole star, enabled also to mark the direction of their route from or towards wells; a highly important class of property in those times and regions. Hence the contemplation of the starry heavens gradually led to an intimate knowledge of the several magnitudes, relative positions, distances, and other phenomena which could not but ensue from the earnest and continuous examination which was thus induced. Astronomy from such causes must have made very considerable advances, even as a regular science, before the deluge; and indeed, there are remains of antediluvian astronomy, which attest that those extreme ancients had made important progress therein.

The second of those causes above alluded to, was one originating in necessity, and is to be found in the history of the early Egyptians. The people of that country would be naturally anxious to arrest the progress of the mischief which annually befel them, in the inundation of the Nile; and, as has been the case with mankind in all ages, to turn even an apparent curse into a blessing. To effect so desirable a purpose, it was necessary to find a monitor competent to apprize them betimes of the approach of their formidable enemy; and this at length was found in the rising of a particular star. When that period arrived they were admonished to secure their possessions from the raging of the torrent; they even began to set up embankments, so as to restrain the flood for a while; they formed sluices for the gradual and innocuous admission of the waters; ditches, drains, and water courses were progressively introduced over the face of the country, and the once dreaded Nile became the most powerful auxiliary towards the wealth and happiness of Egypt. Astronomy therefore became a study all-important there as well as in Chaldea; and as a knowledge of the heavens imparts confidence in our wanderings over the earth, so therefore did mankind feel now more emboldened in prosecuting journeys to distant places, and were induced to draw out the rudiments of Geography.

The lecturer here availed himself of the position which he had taken on the Egyptian hypothesis, to point out the probable origin of geography in India, China, and among the earliest American inhabitants. He urged, that, by a parity of reasoning, the people at or near the mouths of those great rivers which were periodically swelled by the mountain torrents so as to become dangerous to life and property, would earnestly investigate the geographical means in the courses of those rivers, in order to restrain, if not to subdue their sweeping impetuosity, and render them if not practically useful, at least harmless, in their sublime career.

In pursuing his investigations, Mr. Paterson advanced the opinion that very little was known of geography, as a practical science, before the expedition of Alexander the Great. It was true that both Pythagoras and Herodotus had travelled much, and noted well what they saw; but their remarks were incidental and methodical; Xenophon also with his ten thousand Greeks, in their famous retreat, stepped over a large portion of the earth's surface; and that great captain made useful military observations, which were afterwards turned to valuable account by Alexander, who probably availed himself much of them in his subsequent Asiatic undertakings. There was, however much valuable matter extant, even in the time of Alexander, which only needed to be collected and methodized to become the foundation of a geographical system; but unfortunately such a collection in those times would have been a difficult task.

The lecturer now points out the first treatise directly and decidedly geographical, that was given to the world. This was by order of Alexander the Great, who throughout the whole of his brilliant but brief career, had shown himself anxious for the cause of science, and who had taken with him two distinguished mathematicians, whose exclusive duties were those of geography. When this "conquerer of the world" resolved to retreat westward upon his own footsteps, he sent one of his captains, *Nearchus*, down the Indus, with orders to sail westward through the Arabian sea, and join the main forces of the Macedonian prince by way of the Persian Gulf. This was done, and the details of the voyage were carefully noted. The lec-

turer considered this treatise a nucleus around which all subsequent geographical works were formed.

But the true "father of geography," the lecturer considered to be Strabo, who did not flourish till the reigns of Augustus and Tiberius. This great man was able to examine and compare a large collection of matters connected with his subject and from them to draw out Geography into a practical science approximating, at least, to truth. To this end he had, besides minor accounts, those of Pythagoras, Herodotus, Hanno the Carthaginian, Polybius, Xenophon, Diognetus and Beton the geographers of Alexander, Nearchus, &c. &c. His own attainments in astronomy and the sagacity of his judgment effected a stable foundation for the science to which he devoted himself; but it was not till long after his time that a substantial superstructure was raised thereon. Ptolemy the astronomer, Pliny the naturalist, Vitruvius the architect, and Arrian the historian, all did somewhat for the advancement of geography; but the dark ages approached, the Barbarians overran Italy and all the civilized portions of the Roman empire; arts, sciences, books, instruments, all were overwhelmed in the torrent of fierce and rapacious adventurers, who treated with contempt, or worse than contempt, every thing that was not martial in Europe. It appears, however, that the Chinese, the Hindoos, and the Arabians continued to make progress in geography; and the works of the last were mainly instrumental in the recovery of that science when brighter days began to dawn on the European continent.

The lecturer observed that one of the most important benefits, both to the subject of his discourse and to civilization generally, resulted from those fanatical expeditions called the Crusades. He showed how bringing together an immense concourse of people from different and strange nations produced a collision and comparison of opinions, habits, and capabilities. Important information was exchanged, and laudable curiosity was excited; interchanges of communication and of trade took place; and mankind found themselves insensibly wiser, and consequently less presumptuous than before. On the other hand much valuable information on science was gained from the

foe whom they came to conquer ; and although they reaped but a barren reputation by their arms, they acquired treasures of knowledge which will not pass away so long as the world shall endure. The Crusades moreover brought into notoriety and subsequent greatness the Italian states of Venice and Genoa ; the former of which became the carrier of stores to the christian armament and the sole traders with the east by way of the Red Sea ; the latter not to be left behind, carried on a trade with the east also, by way of the Persian Gulf and across Syria. Towards the close of the 13th century, a Venetian named Marco Polo traveled extensively in the interior of Asia, and subsequently gave his valuable remarks to the world upon China, India, and the Indian Isles, and much of the eastern parts of Africa, until then little known. He it was who incited to that India trade, which has ever since been of such immense importance to the commercial world.

That which gave to geography a new and magnificent continent, took from the Venetians and the Genoese their important traffic,—the discovery of the polarity of the needle. By its aid Columbus dashed fearlessly over the waves of the Atlantic and discovered America, with its exhaustless treasures of good for the wants of mankind, social and civil liberty being among the best of them, although then but latent in her bosom. Impelled by his example Vasco de Gama persevered in a hitherto hopeless course, made his way round the “Cape of Storms,” but henceforth to become the “Cape of Good Hope,” reached India by way of the ocean, and turned the great tide of commerce from the Italian republics for ever, to enrich, for a while, the enterprising Portuguese, but to draw thence, as to a common centre, all the enterprising spirits of the civilized world, to that universal mart.

From this time Mr. Paterson observes, there was no further ground for complaint, concerning the slow progress of geography. That most wakeful spirit of human nature, cupidity, was abroad ; in many instances accompanied by curiosity, love of science, an adventurous feeling, religious enthusiasm ; all, however, lending additional stimulus to desire, and the whole world became quickly overrun, after the Atlantic had been

crossed, and the nautical passage to India had been effected. Accounts of voyages and travels were daily multiplied. Vespucci followed hard upon Columbus and gave America its name; Balboa reached Peru and first saw the waters of the Pacific; thus convincing himself that he was not, as he imagined, in farther India, but that there was still a wide extended ocean to cross. Cortez conquered Mexico and extended his arms along the western frontier of the American continent; Ximenes, one of his pilots, discovered California; Magelhaens passed through the straits which bear his name and entered the great Pacific ocean; he had the misfortune to be cut off, but his ships completed the first circumnavigation, although that honor is ascribed to Drake the British navigator. With the latter there appeared a whole host of nautical travelers, and the great oceans of this globe soon became generally known.

The lecturer here took a rapid view of the travels and discoveries by sea and land, of the most distinguished persons who have done service to geography, including the Cabots, father and son, Wallis, Cook, Anson, Byron, Vancouver, Owen, Parry, Ross, Bruce, Park, Denham, Bowditch, Laing, Tucker, Clapperton, and various others; from thence he speculated on the "north-west passage," took a cursory glance at the Danish claims to early American discovery, remarked on the improbability of a new southern continent, and wound up his lecture by a comparison of the information now possessed on the subject of geography with that which was known in the time of Strabo. He concluded with a few pertinent remarks on the advantages morally and socially, independently of those in a worldly view, which result to mankind by the extensive diffusion of geographical knowledge, and on the great improvement in practical science, and mechanical skill which have been the effect of carrying out the enterprises to which the advancement in geographical information gave rise.

ORAM'S COMPRESSED FUEL.

It will be remembered by the reader, that our last number contained the results of some experiments made at the Wool-

wich dock yards with several kinds of fuel, among which was an improved fuel discovered by Thomas Oram, of the county of Middlesex, Eng. The decided advantages of the patent fuel over all others used in the experiments referred to above, render it desirable to know its composition and the process of manufacturing it. These may be gleaned from the following extracts from Mr. Oram's patent.

The materials employed by me are first, small or dust of bituminous coal.

Secondly, mud, alluvial deposits, marl, clay, and other earth, containing vegetable matter.

Thirdly, water; and there are several other substances which may, under certain circumstances, be employed with the above three, but are not absolutely necessary to make a good fuel, such as mineral tar, coal tar, gas tar, mineral pitch, vegetable pitch, resin, asphaltum, or any other bituminous matter, chalk, or lime, saw dust, anthracite or stone coal, coke or coke dust, and breeze. And in order to give the best information in my power for carrying out my invention, I will describe a process of combining and forming these materials into several species of fuel.

Description of the process employed.—Take 30 lbs. of vegetable tar, coal tar, gas tar, mineral pitch, vegetable pitch, resin, asphaltum, or any other bituminous matter, (Note—the vegetable tar, coal tar, and gas tar, will readily mix with the other ingredients used, but if either mineral pitch, vegetable pitch, resin, asphaltum, or any other bituminous matter be employed, it should first be dissolved in boiling water, and whilst hot, mixed with the other materials,) 18 lbs. of dry mud, (the best for the purpose is that taken from rivers,) clay, marl, or any other earth containing vegetable matter, and 50 gallons of water, and mix them together; then add, by degrees, 30 lbs. of powdered lime (stone lime is the best) or chalk passed through a fine sieve, and 1 ton of small or dust of bituminous coal. The whole should then be well stirred up with rakes or other suitable instruments, until the several materials are thoroughly combined, or they may be mixed together by machinery; it being necessary to obtain a perfect blending of the materials, in order to their adhering together and burning equally. The materials so combined are then to be put into moulds of any shape, (though it were better that they should be either square, oblong, or angular,) the dimensions of which may be of any size found most convenient, and then pressed, either in a screw, lever, or other press; but I claim the combination as an invention, whether the same be submitted to pressure or not, the object and advantage of pressing being the holding of the materials together, to increase the period and duration of combustion, and reduce the bulk as much as practicable. The lumps or blocks thus produced are to be placed to dry, leaving spaces between the lumps for the circulation of the air, and it will facilitate the drying to place them in a room or shed, the atmosphere of which can be heated; though in warm, dry weather this will not be necessary.

I have also to describe another species of fuel which forms a desirable fuel for use in furnaces having a powerful draught. Take 10 cwt. of small oven made coke or coke dust, (which proportions will admit of variation,) 30 lbs. of tar, or any other of the bituminous matters before specified, 200 lbs. of dry mud, clay, marl, or other earth containing vegetable matter, 50 gallons of water and 30 lbs. of lime or chalk, and mix, mould, and press them in precisely the same manner as described for manufacturing the first mentioned fuel.

I have also to describe a third species of fuel. Take 15 cwt. of small or dust of bituminous coal, 5 cwt. of breeze, (which proportions will also admit of variation,) 30 lbs. of tar or any other of the bituminous matters before specified, 200 lbs. of dry clay, marl, mud, or other earth containing vegetable matter, 50 gallons of water, and 30 lbs. of lime or chalk, mixed, moulded, and pressed in like manner.

I have also to describe a fourth species of fuel. Take 13 cwt. of the anthracite or stone coal, 7 cwt. of small, or dust of bituminous coal, (which proportions will admit of considerable variation,) 40 gallons of water, 40 lbs. of tar or other bitumen as before, 30 lbs. of lime or chalk, and 180 lbs. of dry clay, mud, marl, or other earths containing vegetable matter, mixed, moulded, and pressed in like manner.

I have also to describe a fifth species of fuel. Take 15 cwt. of small, or dust of bituminous coal, 5 cwt. of sawdust, (which proportions will admit of considerable variation) 40 lbs. of tar or other bitumen as before, 200 lbs. of dry clay, mud, marl, or other earth, containing vegetable matter: 70 gallons of water, (the quantity of water must be varied in proportion as the quantity of saw dust is used,) 30 lbs. of lime or chalk, mixed, moulded and pressed in like manner.

I have also to describe a sixth species of fuel. Take 5 cwt. of peat turf, peat earth, peat moss, or bog earth; 5 cwt. of sawdust; 10 cwt. of small, or dust of bituminous coal; 30 lbs. of lime, or chalk; 30 lbs. of tar, or other bitumen as before; 200 lbs. of dry clay, mud, marl, or other earth containing vegetable matter, and 70 gallons of water, mixed, moulded and pressed in like manner.

I would observe, that in manufacturing each of the above species of fuel, the ingredients "lime" and "bitumen" may be omitted, but I find that the use of them not only increases the adhesion of the other materials, but the lime has the effect of neutralizing the sulphurous acid gas contained in the coal, and the bitumen adds to the ready combustion of the fuel. And further, that I prefer the use of vegetable tar to any other bitumen, of mud, (especially river mud, and more particularly such as is taken from the river Thames) to any other earth, of stone lime, to chalk or any other description of lime; and the sawdust from the pine to the sawdust of any other description of timber.

MECHANICAL SCIENCE.

The following rule for determining the size of journals for shafts appeared, we believe, originally in the Mechanics' Magazine a work under the editorial charge of D. K. Minor, Esq.

and at that time the medium of publication for the transactions of the Mechanics' Institute. We republish it from a belief in its great usefulness to the practical machinist.

STRENGTH OF THE JOURNALS OF SHAFTS.

Lateral Strength.

Mr. Roberson Buchanan, in his essay on the strength of shafts, uses the following rule, which is simple enough, and easy to be remembered: "the cube root of the weight in cwts. is nearly equal to the diameter of the journal." "*Nearly equal*"—being prudent to make the journal little more than less, and to make a due allowance for wearing.

EXAMPLES.—What is the diameter of the journal of a water wheel shaft, 13 feet long, the weight of the wheel being 15 tons?

$$\sqrt[3]{15 \times 20} = 6.7 \text{ or } 7 \text{ inches.}$$

But the following rules are the most correct, and ought to be used on all occasions:

When the weight is in the middle.

1. RULE.—Multiply the weight in pounds by the length in feet; divide this product by 500, and the cube root of the quotient will be the diameter in inches.

When the weight is between the middle and end.

2. RULE.—Multiply the short end by the long end; then multiply that product by four times the weight in lbs. Divide this product by 500 times the length in feet, and the cube root of the quotient will be the diameter in inches.

When the load is uniformly distributed over the length.

3. RULE.—Multiply the length in feet by the weight in pounds, and one tenth of the cube root of the product will be the diameter in inches.

When fixed at one end, and the load applied at the other.

4. RULE.—Multiply the length of projections in feet by the weight in lbs. and the fifth part of the cube root of this product will be the diameter in inches. [This last does not directly apply to shafts—but it may be useful for other purposes.]

By Rule 1: EXAMPLES.

$$\frac{33600 \times 13}{500} = 873 \quad \sqrt[3]{873} = 9\frac{1}{2} \text{ in. dia.}$$

By rule 3:

$$33600 \times 13 = 436800 \quad \frac{\sqrt[3]{436800}}{10} = 7.65 \text{ in.}$$

To resist tension or twisting.

It is obvious that the strength of a revolving shaft is directly as the cubes of its diameter and revolutions; and inversely as the resistance it has to overcome.

Mr. Buchanan, in his essay on the strength of shafts, gives the following data, deduced from several experiments, viz: That the fly wheel

shaft of a 50 horse power engine, at 50 revolutions per minute, requires to be $7\frac{1}{2}$ inches diameter; and therefore the cube of this diameter, which is = 421·875, serves as a multiplier to all other shafts in the same proportion; and taking this as a standard, it gives the following multipliers, viz:

For the shaft of a steam engine, water wheel, or any shaft connected with a first power, - - - - - 400

For shafts in insides of mills, to drive smaller machinery, or connected with the shafts above, - - - - - 200

For the small shafts of a mill or machinery, - - - - - 100

From the foregoing, the following rule is derived, viz:

The number of horses' power a shaft is equal to, is directly as the cube of the diameter and number of revolutions; and inversely, as the above multipliers.

Note.—Shafts here are understood as the journals of shafts—the bodies of shafts being generally made square.

EXAMPLE 1.—When the fly wheel shaft of a 45 horse power steam engine makes 90 revolutions per minute, what is the diameter of the journal?

$$\frac{45 \times 400}{90} = 200 \quad \sqrt[3]{200} = 5.8 \text{ in. dia.}$$

EXAMPLE 2.—The velocity of a shaft is 80 revolutions per minute, and its diameter is three inches. What is its power?

$$\frac{3^3 \times 80}{400} = 5.4 \text{ horse power.}$$

EXAMPLE 3.—What will be the diameter of the shaft in the first example, when used as a shaft of the second multiplier?

$$\frac{5.8}{1.25} = 4.64, \text{ or } \frac{\sqrt[3]{45 \times 200}}{90} = 4.6 \text{ in. dia.}$$

[The diameters of the second movers will be found by dividing the numbers in the table by 1.25, and the diameters of the third movers by dividing the numbers by 1.56.]

The more abstruse rules of arithmetic are seldom remembered after our school days with sufficient clearness to render their application easy; we therefore insert the following simple and concise rule for the extraction of the cube root, furnished by a friend who has had much experience in teaching these matters.

RULE.—Point off every *third* figure, beginning with the units; find the greatest cube number contained in the first left hand period, and place the cube root of it in the quotient. Subtract its *cube* from the first period and bring down the next three figures; divide the number thus brought down by 300 times the square of the first figure of the root, and it will give the second figure; add 300 times the square of the first figure, 30 times the product of the first and second figures and the square of the second figure, together, for a divisor; then multiply this divisor by the second figure and subtract the result from the dividend; and then bring down the next period, and so proceed till

all the periods are brought down. EXAMPLE.—Required the cube root of 48228544.

48228544 (364	Divide by	$300 \times 3 \times 3 = 2700$
27		$30 \times 3 \times 6 = 540$
3276) 21228		$6 \times 6 = 36$
19656	First Divisor,	3276
393136) 1572544	Divide by	$300 \times 36 \times 36 = 388800$
1572544		$30 \times 36 \times 4 = 4320$
		$4 \times 4 \times 4 = 16$
	Second Divisor,	393136

The following is a table of the diameters of shafts, being the first movers, or having 400 for their multipliers, upon the foregoing principles.

TABLE.

Diameters of the Journals of First Movers.

Horse Power.	REVOLUTIONS.									
	10	15	20	25	30	35	40	45	50	55
4	5.5	4.8	4.5	4.	3.7	3.8	3.5	3.3	3.2	3.1
5	5.9	5.1	4.7	4.4	4.1	3.9	3.7	3.6	3.5	3.3
6	6.3	5.5	5.	4.6	4.4	4.1	4.	3.8	3.7	3.6
7	6.6	5.8	5.2	4.9	4.6	4.4	4.2	4.	3.9	3.7
8	6.9	6.	5.5	5.1	4.8	4.6	4.4	4.2	4.1	4.
9	7.2	6.3	5.7	5.5	5.	4.8	4.5	4.4	4.2	4.1
10	7.4	6.6	5.9	5.6	5.2	4.9	4.7	4.6	4.4	4.2
12	7.9	6.9	6.3	5.8	5.6	5.4	5.2	5.	4.8	4.6
14	8.3	7.2	6.7	6.2	5.9	5.6	5.4	5.2	5.	4.7
16	8.7	7.6	7.1	6.6	6.1	5.8	5.6	5.4	5.2	5.
18	9.	7.9	7.5	7.	6.6	6.2	5.8	5.6	5.4	5.2
20	9.3	8.1	7.4	7.2	6.6	6.4	6.9	5.7	5.6	5.4
25	10.	8.5	8.	7.4	7.1	6.8	6.3	6.	5.9	5.6
30	10.7	9.3	8.4	7.9	7.4	7.1	6.9	6.7	6.5	6.3
35	11.4	9.8	8.9	8.4	7.9	7.4	7.1	6.9	6.6	6.5
40	11.7	10.5	9.3	8.8	8.3	7.8	7.4	7.2	6.9	6.7
45	12.	10.6	9.7	9.2	8.7	8.1	7.6	7.4	7.	6.8
50	12.6	11.	10.	9.3	9.	8.5	8.	7.8	7.4	7.3
55	13.4	11.4	10.4	9.8	9.1	8.8	8.4	8.	7.5	7.4
60	13.6	12.	10.8	10.	9.3	9.	8.6	8.2	7.7	7.6

INCHES DIAMETER.

On the mode of producing fac-simile copies of Medals, &c. by the Agency of Voltaic Electricity.

To the Editor of the London Journal and Repertory of Arts, &c.

SIR,—You request a condensed account of my voltaic process of working copper. I shall endeavor to give you one, premising, I shall divest it as much as possible of electro-chemical detail, that it may be rendered quite intelligible to those unacquainted with that science.

It has been long known that one metal will precipitate another from its solution. As one instance, if we take a solution of sulphate of copper, the blue vitriol of commerce, and dip the blade of a penknife in it, in a few seconds it becomes coated with pure metallic copper. We have here an instance of simple electro-chemical action, and I may say the type of all the experiments I have lately published on the subject. Subsequently, it has been found that copper itself possessed this quality, by acting on *its own* solutions, and to a much greater extent than in the first instance, but under a somewhat different condition.

If we take a clean copper wire and dip it into a solution of the sulphate of copper, on taking it out, we find no perceptible difference is made on its surface. If we now take the copper wire, or slip of that metal, and solder to one of its ends a piece of zinc, and bend the two metals so combined into the shape of the letter u, and again place the copper end in the cupreous solution, and the zinc end in a very weak solution of salt and water,—if allowed to remain some time, it will be found the copper end has received a thin coating of solid copper. In this instance, as in most others connected with continued galvanic arrangement, it is a *sine qua non*, that the two fluids must *not* be allowed to intermingle, yet must be in connection with each other.

To effect this, various expedients have been resorted to, with more or less success; but to give a simple illustration of how this may be effected, in order to attain the result mentioned above, take a piece of stout brown paper, and bend it into the form of a piece of tube about three inches long, and perhaps an inch in diameter. This may be conveniently done, by bending the paper round a phial to make it assume the desired form; let the edges of the paper overlap, and fasten them together with a bit of sealing wax. A paper tube is thus obtained, open at both ends, but one end must be closed; this may be done simply, by cutting a piece of card into the shape of the bottom end, but a little larger, and fastening it on with sealing wax, just as we would take an impression of a seal, by covering the disc of card with the wax, and while soft dip the end of the paper tube into it; when set, we shall thus obtain a vessel capable, to a certain extent, of containing a fluid, yet from its porous texture, this fluid would be in connection with any other fluid that might surround it on the other side.

Having obtained such a tube, we three parts fill it with salt and water, or better still, glauber salt and water, which is a sulphate of soda. We then take a common drinking tumbler, containing a quantity of sulphate of copper in solution, and take the paper tube containing the saline solution, and immerse it in the tumbler, taking care that both fluids shall attain the same level. If we now take the bent slip of copper and zinc, and place the copper end of it in the cupreous solution and the zinc end in the saline solution, contained in the paper tube, and let this remain at rest for a few hours (if in a warm situation so much the better) it will be found on removing the combined pieces of metal, that the copper end has obtained a solid covering of pure copper. I have here described an elementary voltaic battery,—and the most extensive one ever constructed, is only a combination of such simple arrangement connected together by copper wires.

In this arrangement the inside of the paper tube, containing the saline solution, is termed the positive cell,—the outside one—the tumbler

containing the cupreous solution—is termed the negative cell. The zinc end of the combined metals, is termed the positive electrode,—the copper end, the negative electrode. With a modification of this very simple apparatus, all the experiments of this process may be readily performed. I have judged the above explanation necessary, as many persons have imagined the apparatus when constructed, was in some way or other connected to a galvanic battery.

By performing the above experiment, we acquire a clear idea of voltaic arrangement, while the eye becomes acquainted with the phenomena produced.

Were I required to produce an exact fac-simile of a medal in copper, I should proceed as follows:—Suppose it were equal in size to half-a-crown,—I should procure a piece of glass tube, (a short gas glass of the largest diameter does best) and then take a piece of flat glass and oil its surface slightly,—this done, I place one end of the tube on the oiled glass, and pour into it some fluid plaster of paris, to the depth of $\frac{1}{2}$ or $\frac{5}{8}$ ths of an inch; when this sets, the oiled glass will easily slip off, and a porous bottom will thus be given to the tube, which in all cases should be of equal or superior diameter to the medal required to be copied. This, and a common size drinking tumbler, comprehends nearly all the apparatus required.

I should now procure two pieces of pretty thick sheet lead, and with a plane, smooth one of the surfaces of each piece, in the manner wood is planed. I then take the medal to be copied, and place it between the bright surfaces of the pieces of lead, and place the whole under a press. Should the medal not be very large, a copying press will be found sufficient, but when larger, a more powerful one is requisite. In either case the object to be acted on must be under the centre of pressure.

When removed from the press a most exact mould of each side of the medal will thus be obtained. I now take a piece of copper wire, varying in length according to the size of the apparatus,—in the present instance, from 12 to 16 inches may be used. To one of its ends, I solder a piece of zinc, rounded, and sufficiently large to go into the gas glass. To the other end I solder* one of the leaden moulds. I have now what is termed a “galvanic pair,” the leaden mould constituting the negative electrode, and the zinc the positive one.

The wire is now bent in such a form, that the lead and the zinc will be opposed to each other,—the opposed surfaces being distant about $1\frac{1}{2}$ inches. To effect this, bend the wire into a right angle, at its junction with the lead, and place the lead in a horizontal position, at the bottom of the tumbler,—the impressed side being uppermost. The gas glass, with its plaster bottom, must now be placed exactly over the lead mould.† The wire must again be bent in the shape of the letter u, in order that the zinc end may go into the gas glass and *touch*, or nearly so, its plaster bottom. This like the lead, must lay horizontally, on the bottom

* The wire should be soldered to the blank side of the lead.

† In order that the gas glass may not *rest* on the plate to be deposited on, I suspend it by a wooden collar, which rests on the outside vessel, and keeps the bottom of the inside one, at a quarter of an inch distance from the plate.

of the interior cell. To conveniently effect this, the end of the wire should be soldered to the centre of the zinc disc.

These arrangements being neatly effected, I now pour a hot saturated solution of sulphate of copper into the tumbler, being in connection with the lead. A few undissolved crystals may be added with advantage. I next pour a hot solution of glauber salt into the gas glass, in connection with the zinc, taking care it does not exceed the level of the fluid in the outside cell. This latter solution must not be saturated, but only a few crystals of the salt put in the water. This may now be allowed to remain for a day or two, until the blue color of the cupreous solution is assuming a pale green; then add a few crystals of the salt of copper. Should a very thick deposition of copper be required, it is well to renew the solutions entirely, as the acid that is set free, materially interferes with the success of the process.

This process may be quickened in a very great degree, by the application of heat, and the metal so deposited, is of a much superior character to that deposited under a common temperature. The apparatus I have described, may be kept at a temperature of from 120 to 160°, by being placed at the side of a fire, and a deposition got in a very few hours.

When it is judged the requisite thickness is deposited, I proceed to get the copper so deposited, off the mould, as follows: previous to immersing the lead into the solution, I generally varnish the back and edges of the mould, to prevent deposition on any other portion of its surface than that opposed to the zinc.

On removing it from the apparatus, I file the edges of the copper until they are flush or parallel with the lead. I then heat the copper side by holding it over the fire, and suddenly plunge it in cold water. On examination it will be found some portion is loosened from the lead when, by inserting the edge of a knife, the plate of copper will come readily off, bearing a *most exact* impress of the original.

I have thus far described how to proceed, in the progress of taking a single medal; but it will at once be perceived, that the same instructions apply to a sheet containing an indefinite number, by only enlarging the apparatus. By exactly the same process here described, I have succeeded in obtaining exact copies of engraved wood blocks and copper plates. I have also succeeded in stereotyping in copper, some elaborate ornamental printing, equal in area to a large octavo page.

I have used lead for most of my latter experiments, instead of copper, as that metal precipitates copper, when in connection with zinc, and it is much easier got off the mould, in consequence of the different degrees of expansibility possessed by the two metals, on the application of heat. The time occupied by the whole process, is also materially abridged. I have not yet had an opportunity of trying the "fusible metal," that melts at a temperature of 212° Fahr. It must also be borne in mind, that as far as our knowledge extends, it is an electrochemical law, that a *metallic* surface must be present, before we are able to precipitate a metal from its solution.

THOMAS SPENCER.

☞ This process has been much simplified by Franklin Peale, Esq. first coiner of the mint at Philadelphia, a full account of which will be given in our next number. A large medal executed by Mr. Peale, may be seen at the library of the Mechanics' Institute in this city. ED.

MISCELLANEOUS.

M. Pape's Patent Table Piano Fortes.—Amongst the objects of the fine arts admitted at the late exhibition of the produce of French industry, pianos were, unquestionably, the most remarkable. Sixty-seven masters sent to the exhibition nearly two hundred pianos, amongst which were several of an entirely new shape ; such as table, gueridon, oval, hexagon, and consol. These new instruments are made at the manufactory of M. Pape, piano-maker to the king, who also exhibited a square piano, which judges have justly considered as a master-piece of its kind. The latter is veneered with sheets of ivory, part of which is carved and inlaid, and forms a most beautiful mosaic design. M. Pape obtains these ivory sheets by means of spiral machinery of his own invention, which produces from elephant's teeth of an ordinary size, sheets of from twelve to fifteen feet in length, and two feet in width. This invention will, no doubt, be appreciated by miniature painters, to whom this mechanical discovery will be of very great advantage. M. Pape also exhibited an horizontal, grand piano, of a small size. The most remarkable improvement in this instrument is the sounding-board, which is so disposed that the tension of the string stretches, and keeps the sounding-board level. The consequence is, that the sound improves in course of time, whilst in pianos of the ordinary construction, the contrary will happen. M. Pape's new instruments have attracted the attention of the royal family, and her Royal Highness the Duchess of Orleans has purchased one of the table pianos for her own use.

Inventor's Advocate.

The plan here spoken of, for producing large sheets of ivory by sawing around the tooth, has been practised for some time in this city.

Alpaca Wool.—At a late meeting of the British Association, Section D, (Zoology and Botany) on the Saturday, some remarks were made on the introduction of a species of *Auchenia* into Britain, for the purpose of obtaining wool, by Mr. W. Danson. Samples and manufactured specimens of Alpaca wool, in imitation of silk, and without dye, as black as jet, were exhibited ; and Mr. Danson stated, that the animals producing it ought to be propagated in England, Ireland, Scotland and Wales ; and to the two latter places the Alpaca is well suited, being an inhabitant of the Cordilleras, or mountainous district in Peru. Importations have already taken place to the extent of 1,000,000 pounds, and are likely to increase. There are five species of Llamas : of which the Alpaca has fine wool, six to twelve inches long, as shown by the specimens exhibited ; the Llama, the hair of which is very coarse ; and the Vicuna, which has a very short, fine wool, more of the beaver cast. The Earl of Derby has propagated the Alpaca in his private menagerie, at Knowsley ; and Mr. Danson understood that Mr. Stephenson, at Oban, in Scotland, has a few of these animals. Their wool would not enter into competition with the wool of the sheep, but rather with silk. It is capable of the finest manufacture, and is specially

suiting to the fine shawl trade of Paisley, Glasgow, &c. The yarns spun from it are already sent to France in large quantities, at from 6s. to 12s. 6d. per pound, the price of the raw Alpaca wool being now 2s. and 2s. 6d. per pound. Mr. Vigors stated, that one of the objects of the Zoological Society of London, was to introduce animals which might be made available for draught, food, or clothing. Amongst others, this animal had been kept in the Society's gardens. They bred and looked well, but were subject to disease, which was the case with most foreign animals at first. Animals were generally found adapted to the districts in which they lived, as the camel, &c.; but animals which afforded food and clothing, are usually capable of universal dispersion, as the horse, sheep, &c. He believed that in the course of time the Llamas referred to would be acclimated amongst us.

Athenæum.

The Art of Illuminating revived.—M. Galot, we believe, of Brussels, has succeeded in accomplishing the illumination of MSS. with all the brilliancy which characterizes the works of the middle ages. Most of the paintings of the old MSS. are relieved with gold: the figures, too, and minor parts, are frequently brought out from a flat ground of gold, sometimes from a rich bed, in imitation of tapestry; but from the introduction of too much gum, the richest illuminations chipped and cracked in the bending of the page. M. Galot contrives to remedy this difficulty; and by his new process, succeeds in producing illuminated MSS. equal in beauty to those of the middle ages. We are not so much gratified with the revival of this art, as an art, as with the consolation which it affords the scholar, that the works which are daily going to decay, though almost imperceptibly, may thus be snatched from ruin by a timely interference. Belgium is rich in these choice objects. The missal of St. Louis, (IX) and of Anne of Brittany, are in the Royal Library; the “*Livre d’Heures*” of Catharine de Medicis is in the possession of the Baron Van Hoorn, of Holland. The Royal Library also contains a great number of very choice poems and romances of the 12th, 13th, and 14th centuries.

Inventor's Advocate.

Antique Artillery.—Some curious relics of ancient English artillery and ammunition have recently been discovered upon the western shore of the Isle of Walney, Lancashire, buried in the sand and clay, at a place only accessible at low water. They consist of a gun ten feet in length, the breech in the centre, so as to fire both ways, with two rings near the muzzle, to sling it by. This piece is formed of thick plates of iron, hooped. Other guns, and stone balls of different sizes; a pair of bronze compasses of curious construction, some old swords, a buckle, and a number of other articles.

Whitelaw's Water-Mill.—This new mode of applying the power of water, is an invention which will in all probability supersede most of the water-wheels now in use, and is applicable where water-wheels cannot now be adopted, as in high and small streams, or in very low falls. The engine recently erected at Mr. Sterrat's works, near Paisley, to the present time continues to work most admirably—nine-tenths of the weight of the water being obtained as effective power. It is also

as completely under control as a steam-engine, and has likewise a self-acting governor. One of the most striking proofs that the whole of the power of the water is exhausted before it issues from the arms of the mill, is, that although they are revolving at a speed of 180 revolutions a minute, the water drops quietly from their mouths on the floor of the mill, in which there is not the slightest current.

Inventor's Advocate.

Salt Water.—Mr. Miller, employed in the inspection of the Greek manuscripts of the Royal Library of Paris, has stated, in a communication to the Academy, that the ancients were acquainted with various methods of making salt-water fresh; that they make mention, among other ways, of distillation, and of receiving the evaporation on sponges, the water expressed from which is perfectly sweet.

Important Discovery.—Professor Graham, at the meeting of the British Association, made an important practical suggestion, which may be the means of saving many lives. He observed that the after-damp, or carbonic acid, left in the atmosphere of a mine after an explosion, is supposed to occasion in many instances a greater loss of life than the explosion; at the same time it renders assistance impracticable. In many cases the oxygen of the air is not exhausted by the explosion, although, from the presence of five or ten per cent of carbonic acid, it is rendered irrespirable. The atmosphere will be rendered respirable, by withdrawing carbonic acid, and he suggested a method by which this might be effected. He found that a mixture of slaked lime and pounded Glauber's salts in equal proportions, has a singular avidity for carbonic acid, and that air might be completely purified from that deleterious gas, by inhaling it through a cushion of not more than an inch in thickness, filled with that mixture, which could be done without difficulty. This lime-filter would be an additional source of security wherever the safety-lamp is necessary, and it should be invariably employed by persons who descend into a mine to afford assistance to the sufferers.

Modes of Measuring Height of Mountains.—We hear that Captain Washington, the Secretary of the Geographical Society, has been occupied in Cumberland during the recess, in trying the comparative accuracy of different methods of measuring the heights of mountains, as Helvellyn, (3055 feet) &c.—1. By Sir John Robison's glass tubes, for bringing a portion of air from the summits, as described at the meeting of the British Association, at Newcastle, (*Athen.* No. 567.)—2. By the temperature of boiling water, as ascertained by a common thermometer. 3. By Newman's mountain barometer, as compared with the heights measured trigonometrically in the course of the ordnance survey.

Athenæum.

Effects of Lightning on Ships.—At the late meeting of the British Association at Birmingham, Mr. Snow Harris stated, that he had lately been collecting instances of damage by lightning in the British navy, and had deduced some results not unworthy of notice. It appeared, in 100 cases of ships struck by lightning, that the number struck on the main-mast were to those struck on the fore-mast as 2 : 1; to those struck

on the mizen-mast, as 10 : 1 ; to those struck on the bowsprit, as 50 : 1. About 1 ship in 6 is set on fire in some part of the hull, sails, or rigging. In one-half the cases, some of the crew were either killed or wounded. In the 100 cases alluded to, 62 were killed, and about 114 wounded. These were exclusive of one case of a frigate, in which nearly all the crew perished, and of 12 cases in which the numbers killed or wounded were set down in the accounts given, as several or many. In these 100 cases, there were damaged or destroyed 93 lower masts, principally line-of-battle ships and frigates ; 83 top-masts, 60 top-gallant masts. Professor Stevelly stated, that he had been almost an eye-witness to a case very similar to those Mr. Harris had brought under notice. When he was delivering a lecture on astronomy at the Royal Institution in Cork, in 1829, a thunder-storm came on, and a ship's mast, within a few hundred yards of the room in which he was sitting, was struck, and the entire mast to within about five feet of the deck, shivered into small fragments, about eight or ten inches long, and as thick as a person's finger. What saved the lower part of the mast was, that the iron pump-handle came near it at the place the ravage ceased. The lightning glanced off along it to the pump iron, and so into the water. Professor Forbes observed, that a collection of facts, such as Mr. Harris had begun, was of more importance to a maritime state like ours, than most persons were aware of. He conceived that experiments might, with much benefit be undertaken, to establish the fact, whether chains or straps of metal would afford the best protection to ships, and in what manner they should be put on, so as to afford the greater security. He was convinced accidents were constantly occurring at sea from this cause, which no person ever heard of: the entire crew, perhaps, perishing between the two awful elements to which they became exposed, after the ship had been set on fire. The case of the New-York packet, which had been struck and set on fire by lightning, was a recent example of the importance of the investigation he was advocating. He had seen the compasses of that vessel after she had been struck ; most of them had their poles completely reversed ; so that, in this case, the danger to which the ship and passengers were subjected was of a very mixed nature. In confirmation of what had been said by Professors Stevelly and Forbes, Mr. Harris mentioned two instances in which masses of wood struck by lightning, without apparent damage externally, but which, nevertheless, had been set on fire within the substance, and had burst into a flame a long time after the accident. This happened on board a Neapolitan line-of-battle ship, in the Mediterranean. The ship had returned from sea, and anchored, after having been recently struck by lightning ; all of a sudden, the mast burst out into a flame. The author considers that many of the Liverpool and American traders, which have been within a few years either wholly or partially destroyed by fire, after being struck by lightning, have suffered from the electric agency having produced a similar result on the substance of the cargo. He thought the consequences of the action of electricity might, with very little trouble, be effectually prevented.

Athenæum.

Lightning Conductors.—One of the most important inventions for the preservation of human life and property, is the application of the

lightning conductors to ships of war and merchant vessels. The old mode of conducting this formidable fluid from the mast-head to the water, and which is still used in many ships, is by copper chains made fast aloft, and descending to the water's edge: these are kept in boxes amongst the stores, until the appearance of the weather indicates that lightning may be soon expected: the men are then sent up to place these chains, if there be time for it; but often, before they can be got ready, the danger has arrived or is past. The conductor we now describe is of a superficial kind. It consists of two *laminæ* of sheet-copper, laid one on the other, in lengths of about four feet: they are placed so that the closed joints of one fall on the continuous portions of the other: their width is from an inch and a half to six inches, according to the size of the mast to be furnished with them, and are together three-sixteenths of an inch in thickness: they are riveted together at the points of junction, to form an elastic and continued line: this is then inlaid at the after-part of the mast, and secured by copper nails. The conducting line of metal in the hull is made perfect and secured upon the keelson. The conductor, thus constructed, will pass from the vane-spindle to the keel, in one unbroken line; and no damage can take place, as there is no interruption to the passage of this tremendous power along the metallic line. These properties of Mr. Snow Harris's conductor were fully tested at the Polytechnic Institution in London, recently, by Mr. Backoffer, the lecturer on experimental philosophy. A square-rigged vessel, afloat in the canal, was fitted with this apparatus, and the powerful electric discharge was communicated to the extreme point of the main-top gallant-mast. It passed along the conductor, and out of the vessel, without injuring any thing, but continuing its course several yards, it exploded some gunpowder in a boat, placed on purpose to prove the actual presence and power of the electric fluid.

Cultivation of the Sunflower.—On inquiring into the use made of this plant, we were given to understand that it is here (in Tartary) raised chiefly for the oil expressed from it. But it is also of use for many other purposes. In the market places of the larger towns we often found the people eating the seeds, which, when boiled in water, taste not unlike the boiled Indian corn eaten by the Turks. In some districts of Russia, the seeds are employed with great success in fattening poultry: they are also said to increase the number of eggs more than any other kind of grain. Pheasants and partridges eat them with great avidity, and find the same effects from them as other birds. The dried leaves are given to cattle in place of straw, and the withered stalks are said to produce a considerable quantity of alkali.

Bremner's Excursions in the Interior of Russia.

Gas produced by a New Process.—An experiment in gas-lighting, by the Comte de Val Marino, was made on Thursday evening, on a piece of waste ground at the back of Fetter-lane, in the presence of several scientific gentlemen, who were invited to witness the result. A small gasometer was erected for the purpose, which was connected by tubes with a furnace built of brick, and containing three retorts, one of which was supplied with water from a syphon; another was filled with tar; and both being decomposed in the third retort, formed the sole materials

by which the gas was produced. The process appeared to be extremely simple, and the novelty of the experiment consisted in the fact, that the principal agent employed to produce the gas, was common water combined with tar; but, according to the theory of the inventor of this new species of gas, any sort of bituminous or fatty matter would answer the purpose equally as well as pitch or tar. After the lapse of about half an hour employed in the experiment, during which time the process was explained to the company, the gas was turned into the burners, and a pure and powerful light was produced, perfectly free from smoke or any unpleasant smell. The purity and intenseness of the flame was tested in a very satisfactory manner, and those who witnessed the experiment appeared perfectly satisfied with the result. The great advantage of this sort of gas over that produced from coal consists, it was said, in the cheapness of the materials employed in its production, the facility with which it is manufactured, and the perfection to which it is at once brought, without the necessity of its undergoing the tedious and expensive process of condensation and purification; for in this instance, as soon as the preliminaries were completed, the light was produced in a perfect state within a few feet of the gasometer, which, although of inferior size, was said to be capable of affording light for ten hours to at least five hundred lamps or burners. With regard to the comparative expense, it was also stated that one thousand cubic feet of gas manufactured by this process, could be supplied to the public for about one-third the price now charged by the coal-gas companies; and it was said to be equally availing for domestic use, and more safe than the common gas, inasmuch as small gasometers might at a trifling expense be fixed at the back of grates in private dwellings, from which the gas could be conveyed in India-rubber bags to any part of the house, thereby preventing the many accidents which occur by the use of tubes and pipes. The Comte de Val Marino, who has conquered the difficulty hitherto experienced in bringing this species of gas into use, superintended the arrangements, and evinced a natural anxiety to bring his experiment to a successful issue. He has taken out a patent for his discovery, and he has improved upon the burners now in use, so as to render the light produced more pure and intense. For this improvement he is also secured by a patent. How far gas of this description can be brought into general use, or whether in point of economy the public would be benefited by its adoption, are questions which we have not the means of deciding; and, without hazarding any opinion on the subject, we can only say, that the experiment, as far as it was tried in this instance, appeared to be quite successful.

Structure of the Earth's Surface.—Had the earth's surface presented only one unvaried mass of granite or lava, or had its nucleus been covered by entire concentric coverings of stratified rocks, like the coats of an onion, a single stratum only would be accessible to its inhabitants; and the varied intermixtures of limestone, clay, and sandstone, which, under the actual disposition, are so advantageous to the fertility, beauty and habitability of the globe, would have had no place. Again: the inestimably precious treasures of mineral, salt and coal, and of metallic ores, confined as these are to the older series of formations, would,

under the supposed more simple arrangement of the strata, have been wholly inaccessible; and we should have been destitute of all these essential elements of industry and civilization. Under the existing disposition, all the various combinations of strata, with their valuable contents, whether produced by the agency of subterraneous fire, or by mechanical or chemical disposition beneath the water, have been raised above the sea, to form the mountains and plains of our present earth, and have still further been laid open to our reach by the exposure of each stratum along the sides of valleys. * * * The total quantity of all metals existing near the surface of the earth (excepting iron) being comparatively small, and their value to mankind being of the highest order, as the main instruments by the aid of which he emerges from the savage state, it was of the utmost importance that they should be disposed in a manner that would render them accessible by his industry; and this object is admirably attained through the machinery of metallic veins. Had large quantities of metals existed throughout rocks of all formations, they might have been noxious to vegetation; had small quantities been disseminated through the body of the strata, they would never have repaid the cost of separation from the matrix. These inconveniences are obviated by the actual arrangement under which these rare substances are occasionally collected together in the natural magazines afforded by metallic veins.

Dr. Buckland.

Cast Iron, Steel, &c.—In a paper read at the late meeting of the British Association, at Birmingham, "On the relative combinations of the constituents of cast-iron, steel, and malleable iron," by Dr. Charles Schafhaeutl, of Munich, the author stated that pure iron could not be welded; that the welding power of iron depended on its alloy with the carburet of silicon, and also that the good and various qualities of all the wrought irons depended on the alloys of pure iron with other metallic bodies; and that the presence of most of the electro-negative metals had been generally overlooked in the existing analyses of iron. The presence of arsenic in Swedish steel, when forged red-hot, could be ascertained by its smell, as well as in the Low Moor iron. The usual solution of iron under analysis, in order to separate those metals from the iron, must be, for the necessary correction, divided into two parts: one to be treated with a current of sulphuretted hydrogen; the other part *dropped* into sulphhydrate of ammonia, and carefully digested. A small quantity of silica was more difficult to separate from a large quantity of iron, than generally seemed to be believed; and the real amount of carbon could *only* be ascertained by Berzelius's method of burning iron in a current of oxygen, or mixed with chlorate of potash and chromate of lead, in a glass tube, used first by Berzelius for analysis of organic bodies. The author maintained that steel was an entirely mechanical production of the forge-hammer, which tore the molecules of certain species of white cast-iron out of their original position, into which the forces of attraction, in respect to the centres as well as to the position of the molecules, had arranged those molecules by the slow action of heat. Steel, as it came out of the converting furnace or the crucible, was nothing more or less than white cast-iron, of which Indian steel, called wootz, was the fairest specimen. The author finally gave

an analysis of two specimens of cast-iron, and one of steel. The first specimen was French gray iron, from Vienne, department de l'Isere, obtained from a mixture of pea-iron ore with red hematite, by means of coal from Rive de Gier and heated air; specific gravity 6.898. The second iron was Welsh iron, from the tin-plate manufactory of the Maesteg iron works, near Neath, in South Wales, obtained from a mixture of clay iron-stone and Cumberland red ore, by means of coke and heated air. It was silvery white, without signs of crystalization; specific gravity 7.467. The third specimen was the fragment of a razor forged in the author's presence, in the work-shop of Mr. Rodgers, of Sheffield, of the specific gravity of 7.92. Several gentlemen, among whom were some connected with the iron trade, expressed a high sense of the value of this communication, from which it appeared that the peculiarities of Swedish iron, in a great degree, depended on the presence of arsenic, and those of Russia iron on the presence of phosphorus.

Athenæum.

Railway Carriages.—F. C. Worsley, Esq. has just taken out a patent for various improvements in locomotive engines and carriages. The engine has the advantage of working from a fixed point, without being interfered with by the action of the springs, as in the present arrangement. It also admits a multiplier of velocity to any extent. The great effect produced, by the application of the power to a given point, in advance of the centre of the driving wheel, is, by its pressing always in a line perpendicular to the rail, (in other words, applying the power of the engine to raise the weight of the carriage, and place it on this given point in advance of the centre of the driving-wheel,) and causing the carriage to roll forward, independent of the bite on the rail. This principle is familiarly illustrated by the coachman, who, when he wishes to get his carriage out of the coach-house, places his weight on the front of the spoke of the hind-wheel, thereby causing it to roll forward. This effect we have seen beautifully illustrated by the working model; which, with this principle applied, will, with smooth wheels, run up an inclined plane of one in four; whereas, in applying the power to the same model in any other way, the wheels grind round, and the carriage remains stationary: indeed, it may be fairly said that the present carriages grind, whilst the improvement of Mr. Worsley would roll the road.

Inventor's Advocate.

Chemical Powers of Light.—M. Edmond Becquerel has recently communicated to the Académie des Sciences, some important investigations on the chemical powers of solar light, which will probably lead to new and valuable results. It has been long known that light has the power of variously affecting certain chemical compounds; sometimes causing combination between two elements, and in other cases effecting the decomposition of compound substances; and it has been found that when a pencil of light is decomposed by passing through a prism of glass, those rays which possess this power are differently refracted from the colored rays, and hence the existence of peculiar rays, to which the name of chemical rays is given, has been deduced. The chief difficulty in experiments on these rays, has been the slow nature of the actions

caused, and the difficulty of appreciating them. M. Becquerel has overcome these sources of uncertainty, and is enabled to study the chemical powers of light with ease, and measure the effects produced with considerable accuracy. The manner in which this is done is very simple. Two liquids, of different densities, but both conductors of electricity, and of such nature as to act chemically upon each other when exposed to the influence of solar light, are selected; and a portion of both is put into a cylindrical vessel blackened on the exterior. A plate of platinum is placed in the denser of the two fluids, and another similar plate is also immersed in the lighter liquid: these plates being then connected by means of platinum wires with the two terminations of a very delicate galvanometer, the apparatus is complete. If when thus arranged, a ray of light is suffered to pass through the mass of fluid, it causes chemical action to take place at the surface of contact between the two liquids, and a current of electricity which this sets in circulation is immediately rendered evident by the galvanometer. As the angle of deflection of the galvanometer indicates the power of the electric current, and as that is in exact proportion to the chemical action which originates it, it is evident that this arrangement gives an accurate measure of the power of the chemical rays of light, at different times, from different sources, and under various circumstances. M. Becquerel details some experiments on the quantity of these chemical rays which is intercepted when a ray of light is made to pass through screens of different substances, such as rock-crystal, mica, and variously colored glasses; and states that he is still engaged in experimenting on the subject.

Intellectual Resources of London.—There are in the metropolis no less than forty-one societies devoted to scientific, literary and collateral pursuits, meeting periodically during the session, which, with the great majority, commences in November, and terminates in June; and these distinct from the literary and scientific institutions, of which there is one in every considerable district. The Royal Society, the parent of the whole, founded in 1663, extends to every department of natural knowledge; but so numerous are the ramifications which have sprung from it, that its attention is now restricted to the more abstract departments of each. For the study of antiquities there are two: the Society of Antiquaries, founded in 1717, for the study of the antiquities of this kingdom; and the Numismatic Society, a flourishing association, which, as its name imports, is confined to coins and medals. For natural history there are eight: the Linnæan Society, alike for the objects of botanical and zoological investigation; in zoology two—the Zoological and Entomological Societies; and for horticulture and botany five, viz. the Horticultural, Royal Botanic, Metropolitan, and Botanical Societies, and the Royal Society of Horticulture, four of which hold periodic public exhibitions. For astronomy there are two, viz. the Royal Astronomical and the Uranian Societies. And for objects of particular or specific investigation, there are the Mathematical, Meteorological, and Electrical Societies. The Society of Arts, which stands alone prominent for the encouragement of the useful arts, was founded in 1754; and objects formerly embraced specially by it, are now comprehended in the more

exclusive exertions of the institutes of British Architects and Civil Engineers, and the Architectural Society. The Geographical and the Geological Societies are, as their names import, addressed to the study of the external characteristics and the structure of the earth. One body only, the Royal Society of Literature, is exclusively devoted to objects of literary research; the Royal Asiatic Society takes the wide and extensive range of the science, language and literature of the eastern continent; and the Statistical Society, dealing with facts, embraces the details of all sciences where numbers are concerned. The number of members in the last session is estimated at about 17,000; but the names of many of these are enrolled in more societies than one. The total amount of the incomes or the sums raised last year for scientific objects, was nearly £41,000; and the funded properties possessed by these societies, estimated last June, was £81,000. Only four, viz. the Royal, Antiquarian, Geological, and Astronomical Societies, receive aid from Government in public accommodation; and one other only, the Geographical Society, is assisted by grants from the same source, in the furtherance of its objects. There are twelve Mechanic Literary and Scientific Institutions, in the immediate circle of the metropolis, which average 4500 members, and an income of £7500. Unaided, therefore, by Government, the total annual amount raised for the diffusion of literary and scientific knowledge in the metropolis is about £50,000.

Art of Floating.—Any human being who will have the presence of mind to clasp the hands behind the back, and turn the face towards the zenith, may float at ease, and in perfect safety, in tolerably still water—aye, and sleep there, no matter how long. If not knowing how to swim, you would escape drowning when you find yourself in deep water, you have only to consider yourself an empty pitcher: let your mouth and nose, not the top part of your heavy head, be the highest part of you, and you are safe; but thrust up one of your bony hands, and down you go: turning up the handle, tips over the pitcher. Having had the happiness to prevent one or two drownings, by this simple instruction, we publish it for the benefit of all who either love aquatic sports or dread them.

Walker.

Invention of the Thermometer.—The invention of the thermometer is generally attributed to Sanctario, an Italian physician of the 17th century. The instrument invented by him, however, is filled with air, and is therefore called an air thermometer; but that in more general use is filled with mercury, and is therefore called the mercurial thermometer. There are two objections to the instrument of Sanctario:—1. The dilatation is so great, that the length of the tube required where the change of temperature is considerable, renders the instrument inconvenient.—2. It is affected by the pressure of the atmosphere, which often varies without a corresponding variation in the temperature. Fahrenheit, of Amsterdam, was the first to modify and improve the instrument of Sanctario: he indeed claims the invention and introduction of the kind of thermometer now in general use. He substituted mercury for air in filling the instrument, which enabled him to use a much smaller one with the same degree of accuracy; but it was still very

defective, inasmuch as no two instruments formed in this way would agree in their results, because there were no fixed points to guide the maker in graduating the scales. Sir Isaac Newton first suggested the plan now in use to obtain the fixed points, founded on the fact that ice or snow melts, and water under similar circumstances boiled at an uniform temperature: consequently these two were made the fixed points from which to graduate the scales of the thermometers. In Fahrenheit's scale, the space between freezing and boiling water is divided into 180 equal parts. Water freezes at 32° , and boils at 212° . The zero, or commencement of the scale, was the result of accident. During the course of Fahrenheit's experiments on the thermometer, he made a visit to Iceland; and while there, fixed upon the temperature he then experienced as the greatest cold that would probably be produced by artificial means, and consequently a suitable point for the zero of the thermometer: this was afterwards ascertained to be the same temperature produced by mixing snow and common salt.

Dr. Hope's Practical Chemist's Guide.

The Wonders of Horticulture.—Innumerable are the advantages which mankind have derived from the horticulturists. Few would suppose that the peach (from which branched the nectarine) had its origin in the almond; or that the shaddock, the citron, the orange, and the lemon, proceeded from the diminutive wild lime. That favorite edible, celery, springs from a rank and acid root denominated smallage, which grows on all sides of ditches, in the neighborhood of the sea. The hazel-nut was the ancestor of the filbert and the cub-nut; while the luscious plum can claim no higher source than the sloe. From the sour crab issues the golden pippin; and the pear and cherry originally grew in the forest. The garden asparagus, which grows, though not very commonly, in stony and gravelly situations near the sea, when growing spontaneously, is a diminutive plant; and none, indeed, but a practised eye, examining into the species which is reared by artificial culture, can discern the least resemblance. Wondrous to relate, the cauliflower, of which the brocoli is a sub-variety, is derived, together with the cabbage, from the colewort; a plant, in its natural state, with scanty leaves, not weighing half an ounce. The Crambe Maritima, which is found wild adjacent to the sea, has been improved into sea-kale; the invaluable potato is the offspring of a bitter American root of spontaneous growth; and the all-tempting pine-apple descends from a fruit which "in foreign climates grows wild by the sides of rivulets, and under the shade of lofty trees."

Liverpool Standard.

Peculiar Characteristics of Australia.—Australia seems to be more unlike the portions of the earth lately known to us, than any part of America, or any of the islands scattered through the Pacific and Indian seas. No volcanoes have yet been discovered, and no proof of the great antiquity of the products on its surface. Nearly all the species of plants, from the grasses to the loftiest ornaments of the forest, are new to the inhabitants of the old world. The indigenous animals are, in several instances, of a different character to any in the countries of the other quarters of the globe, while none but the dogs have any affinity to the animals of this new continent: and it is curious that its rivers and

marshes are not known to contain any of the lizard or tortoise tribes, or any of the great mammalia. The native dog bears some resemblance to a mongrel fox-dog, and has some characteristics indicative of its being so—the effluvium, the tenaciousness of life, its silence when dying, and its peculiar short bark—which lead to the supposition that it is not indigenous, but a race derived from some shipwrecked animal. The human beings which have hitherto been found on the shores, or in the interior, are all of one species, and differ sufficiently in form to constitute a species distinct from any hitherto known. Some anomalies are evident, which belong to no other race. They have great and varied powers of mimicry, without having exhibited naturally any talent for constructiveness; though, when instructed, they have shown an aptitude for building. It has never been ascertained that they have a definite notion of a Supreme Being, who created them and all they see around them. They have neither idols nor sacrifices, prayers nor priests; which places them among the lowest known in the scale of human nature. Their perceptions are quick, and like other savage and wandering tribes, they can discover a track where the civilized man can see nothing to guide him. They are cunning, lively, and capricious; but with feelings of attachment which are to be improved, and a sense of want and inferiority which may be turned to good, both for the settlers and themselves, if patience and Christian charity are exercised towards a race whose country we seize, and whose hunting grounds, on which their existence depends, we enclose, to feed our cattle and grow our corn.

Ogle's Western Australia.

The Harmoniphon.—A musical instrument, lately invented by M. Paris of Dijon, has attracted much notice in France. It resembles the instrument called the *Concertina*, well known in London from the very clever performance of young Regondi; but it seems to be superior, in some respects, to the concertina. The sound is produced by the vibration of thin metallic plates, and it is played by keys like those of the piano-forte; but the air which acts upon the vibrating substances, instead of proceeding from bellows within the instrument, is blown *by the mouth*, through an elastic tube. The excellence of the instrument accordingly consists in this, that while the fingers on the keys merely mark the different notes of the scale, the *expression* lies in the mouth. It is the living breath of the performer which gives accent, articulation, and emphasis to the notes, as in the oboe or clarionet, and enables the performer to “discourse most eloquent music,” in a manner which the production of sound by the mechanical contrivance of a bellows does not admit of. The *Harmoniphon* is made in three varieties: the first is of the compass of the oboe; the second, of the Corno Inglese; and the third (of a larger size than the others) combines both these instruments, and has a compass of three octaves. This instrument is highly approved by the French composers; and one of them, M. Adolphe Adam, has given an account of it in the *Monde Dramatique*, in which its capabilities are pointed out. It is calculated, in particular, to be of great utility in provincial orchestras, where it is an excellent substitute for the oboe—an instrument as disagreeable in the hands of an ordinary performer as it is delightful in those of a Grattan Cooke. Accordingly,

we are informed, the *Harmoniphon* has already been adopted in the orchestras of many provincial theatres and musical societies.

New mode of marking Linen.—A celebrated German chemist, Mr. Hoenle, has invented a new plan for marking linen without ink. This is effected by simply covering the linen with a fine coating of pounded white sugar. The stamp of iron very much heated is impressed on this material. Two seconds suffice for the operation. The linen remains slightly scorched, but the mark is indelible.

New alloys of Metals.—A curious and valuable discovery has just been made in the alloy of metals. A manufacturer of Paris has invented a composition much less oxidable than silver, and which will not melt at less than a heat treble that which silver will bear; the cost of it is less than 4d. an ounce. Another improvement is in steel; an Englishman, at Brussels, has discovered a mode of casting iron so that it flows from the furnace pure steel, better than the best cast steel in England, and almost equal to that which has undergone the process of beating. The cost of this steel is only a farthing per pound greater than that of cast iron.

Mining Journal.

New source of Light.—M. Seguin has communicated to the *Académie des Sciences*, at Paris, a memoir on the distillation of animal substances, in which he states that he had reduced the process to such a degree of simplicity as to render it profitable for the sake of the products. From the carcass of a horse he obtained, by destructive distillation, 700 cubic feet of gas, suitable for purposes of illumination, 24 lb. of sal ammoniac, and 33 lb. of animal black. The gas was composed of one part of olefiant gas, and four of carburetted hydrogen, and might be preserved for months in contact with water, without being in any way injured, or its brilliancy, as a combustible, impaired. M. Seguin found that 3,234 cubic inches, when burnt for an hour, gave twice and a half as much light as a Corcet lamp.

Acacia.—The flowers of a species of the *Acacia* are used by the Chinese in making that yellow which bears washing in their silks and stuffs, and appears with so much elegance in their paintings on paper. They gather the flowers before they are quite open, and put them in a clean earthen vessel, over a gentle heat, and stir them continually, till they become dryish and of a yellow color; then to half a pound of the flowers they add three spoonfuls of clear water, and after that a little more, till there is just enough to hold the flowers incorporated together. They boil this for some time; and the juice of the flowers mixing with the water, it becomes thick and yellow. They then take it off the fire, and strain it through a piece of coarse silk. To the liquor they add half an ounce of common alum, and an ounce of calcined oyster shells reduced to a fine powder. All this is well mixed together, and produces the lasting yellow they have so long used. The dyers of large pieces use the flowers and seeds of the *acacia* for dying three different sorts of yellow. They roast the flowers, as before observed, and then mix the seeds with them, which, for this purpose must be

gathered when quite ripe ; by different admixtures of these, they produce the different shade of color, only for the deepest they add a small quantity of Brazil wood.

New mode of Resuscitation from Drowning.—At the annual meeting of the Bristol Humane Society on Tuesday, the society's silver medal was presented to Dr. Fairbrother of Clifton, for his exertions in recovering a boy who had been under the water in the floating harbor a quarter of an hour, and another quarter of an hour had elapsed before the doctor could operate upon the body. The most remarkable feature in this case is the new mode by which Dr. Fairbrother succeeded in his laudable object ; namely, by closing the boy's mouth with his finger, sucking off the foul air from the lungs through the nostrils, and promoting respiration by pressing on the abdominal muscles on the sides. The usual method is to inflate the lungs, but it is very seldom that persons are recovered by this method if they have been longer than a few minutes under the water.

Berrow's Wor. Jour.

Carbonic Acid as a Moving Power.—Among the most attractive of the scientific novelties exhibited at the late meeting of the British Association at Newcastle, was the solidification of carbonic acid gas, by means of apparatus invented by Robert Addams, Esq. As this remarkable phenomenon has met with less attention in the newspaper reports than on the spot, we have requested Mr. West, who was present, to furnish us with a short account of the experiments. The apparatus consists of a strong wrought iron vessel, in appearance like a swivel gun, two feet long, and six inches diameter, suspended by trunnions on an iron frame ; of a vessel similar in form and size, but mounted perpendicularly on a flat stand ; and of two pumps, worked by powerful levers, together with the needful valves and connecting tubes. Into the generator, or suspended vessel, are put proper quantities of bicarbonate of soda and warm water ; a long open tube is also inserted, containing sulphuric acid : the mouth is closed with a screw valve, and the generator being rapidly whirled round on its trunnions, the sulphuric acid flows out, and is mixed with the solution of bicarbonate of soda. The carbonic acid, disengaged, having no room to expand, is condensed into a liquid. So far the apparatus resembles that first employed for the same purpose by Monsieur Thellussier in Paris. But stopping short here, Thellussier could only make use of about one third of the carbonic acid disengaged ; while Mr. Addams, by pumping it into the second vessel, obtains nearly the whole. On allowing this liquid carbonic acid to escape through a box, or hollow brass cylinder, into the atmosphere, the instantaneous evaporation of one portion causes it to absorb so much caloric as to solidify the remainder. The solid carbonic acid resembles in appearance and texture newly fallen snow, or small hail ; it evaporates rapidly, but not instantly ; from the atmosphere of gas around it preventing close contact, its intense coldness is not immediately felt ; but the brass box in which it is collected, or the solid acid itself when long held, blisters the skin like a hot iron. By placing a portion of the solid acid on a few pounds of mercury, moistened with æther to improve the conduction,

the mercury soon becomes solid ; and thus the freezing of mercury, an experiment which many chemists have never seen, is performed rapidly on a large scale, and with the greatest ease and certainty. Several curious experiments were shown by means of the frozen mercury ; it was doubled up, and placed in water, which instantly froze, while the mercury returned to its ordinary state of fluid. But the most remarkable fact occurred accidentally ; on touching a mass of cold iron, the mercury fused, and ran down from so good a conductor, like lead or tin in a furnace. Professor Graham did not speak too strongly, when he said that such an apparatus would become as needful in the laboratory for the production of cold, as a furnace for producing heat. But the circumstance of most consequence in relation to its practical employment is, that, at a temperature of 150° the liquid acid exerts an expansive force of 70 atmospheres, or 1,050 lbs. on the square inch ; and every increase of a single degree of temperature augments the pressure by upwards of an atmosphere, or 15 lbs. on the inch. The iron cylinders are proved before being used, by a pressure of 150 atmospheres ; and Mr. West states that, remembering the enormous power obtained, and observing the perfect ease and apparent safety with which this force is managed, he, contrary to his previous views, no longer considers the use of liquid carbonic acid as a moving power to be at all chimerical. Should it be so applied with success, our present locomotives would be discarded, stoppages for water would be needless, and on long lines of railway, or for long voyages, steam would be superseded by carbonic acid.

Leeds Mercury.

Artificial Incubation—The Eccaleobion. This is a contrivance for hatching eggs by artificial heat. It differs from the Egyptian method of artificial incubation by means of *mammals*, or ovens heated immediately by fire, which was tried in Paris by De Reaumur, and in London by Mr. Mowbray ; and also from the more recent attempt at the Egyptian hall by means of steam. In what way the heat of the Eccaleobion is produced, we are not informed ; probably it is by hot water ; certainly the operation is simple and effective, as abundant living proofs testify.

In an oblong wooden case, about nine feet in length, and three feet in width and depth, entirely isolated, and divided into eight compartments, each closed by a glazed door darkened, the eggs are placed on cloth, without any covering ; here they remain for twenty-one days, the period of incubation ; at the expiration of which time, the chick liberates itself, and next day is running about and pecking its food as lively as if it had the hen's wings to shelter it. The Eccaleobion is capable of containing upwards of two thousand eggs, and of hatching about a hundred daily ; and though some failures occur from natural causes, the machine, unlike the parent bird, never addles the egg.

It is always contrived that one compartment shall exhibit the last stage of incubation ; and this being open, the visiter may not only hear the faint chirp of the imprisoned chick, but watch its attacks on its oval cell, till having broken the shell all round, it bursts the integuments and liberates itself. At first emerging into this new state of existence, the light and the human eyes gazing on the little chick, together with its extreme weakness, make it appear as if it would fain retire into its con-

finement again; it staggers, closes its eyes, and falls down in an apparently exhausted state, but soon revives, though but for a short time; as soon as it can take food, however, it gains strength rapidly. In the last stage of incubation, the egg may be held in the hand, or placed in a lady's bosom; where if any fair visiter be so minded, the chick may come to light.

In a case fitted with lenses, placed before eggs in different stages of incubation, lighted by gas, the appearances through the shell may be observed; and on a table are placed the contents of several eggs at successive periods of incubation, showing the formation of the embryo, from the first day (as seen under the microscope) to the complete bird, coiled up in its oval form. To trace the gradual development of the eyes, the bill, and cranium, the heart, and circulating system, the feet, feathers, &c. is exceedingly interesting.

The fledglings are placed in partitions and supplied with food, and the room rings with their chirping.

The Eccaleobion process is of course applicable to eggs of every species of bird, but none others than those of the common gallinaceous fowl have been reared: parties bringing the eggs of other birds, however, can have them hatched by the machine, as the same temperature (about 98 degrees of Fahrenheit) is applicable to all, from the wren to the eagle. The introduction of the Eccaleobion into general use, will supply abundance of fowls for the table, at a very cheap rate, and with little trouble; the machinery of the Eccaleobion is also applicable to a variety of scientific purposes, where an even and pervading temperature is required; as it may be regulated at pleasure up to 300 degrees of Fahrenheit.

London Paper.

Note on Electro-Magnetism, by E. Lenz.—In the treatise which Professor Jacobi and myself have written in common on the electro-magnet, we have shown how each of the laws of the magnetic action of spirals upon soft iron, produces another limited but closely corresponding law, according to which, from the want of an iron centre, the stream is spirally evolved. Of these latter laws I have treated elsewhere, (*Mem. de l'Acad. des Sciences, T. 2, 1833.*) but there are certain restrictions which I will now more closely canvass.

I have in my treatise examined the law:—"In spirals of variously graduated circumferences, the electro-motive power of the streams induced from the same iron centre, and the same magnetism therein generated, is independent of the circumference of the spiral windings."

On the other hand, in our common treatise, we have proved that this law is true in the main, that the magnetism generated in an iron centre by a magnetizing spiral may be independent of the circumference of the spirals, but that this law suffers a limitation from those nearest the end of the iron centre; in which case the wider spiral may lose in comparison with the narrower. We have also there shown how this departure from the general rule may be accounted for.

The question now arises, since these laws in both cases correspond so closely, would this restriction of the general law extend also to the magneto electric stream? I believe that a doubt of this cannot exist, as the conclusion by which we explained the diminution of the magnet-

izing action on the increase of the spiral circumference, will apply, *passim*, also to the magneto-electric case.

Indeed, if we look at the figure referred to (Fig. 5, Taf. 2,) in which MN represent the iron centre, a and a' the transverse windings of two spirals upon one and the same level $a' a o$, but projecting at unequal distances from the iron—if, I say, we look at this, and suppose the magneto-electric case that in MN , a magnetism appointed for all experiments, be suddenly withdrawn, a stream will thereby be generated in the windings a and a' ; and this will not only be promoted by the magnetic elements of the iron in the plain (*ebene*) of both streams, but by others, weaker the further they are removed from o , in consequence of the greater obliquity of the windings. We assume that upon a , on the abstraction of the magnetism, the angle man describes a sensibly co-operating section, so also upon a' does the angle $m'a'n'$ describe parts similarly influenced. Upon a and a' will the action be the same, as well in the electro-magnetic as in the magneto-electric instance; and with respect to b and b' , which are at the extremity of the iron, the effect will be equalized. But if the windings do not extend entirely to the end, but only approach it, as in d and d' , a portion of the section in d' will fail to co-operate, while in d none of the effect will be lost, and the influence on the wider spiral d' will also be necessarily weaker than upon d , even when the action is perfectly equal upon a and a' . The law of the electro-motive power of magneto-electric streams applies particularly to iron rods of unlimited lengths,

But in such case the question arises how did it happen that in my earlier researches I did not discover this departure, small though it be, from the general law which renders the electro-motive power of magneto-electric streams independent of the width of the spiral windings? A closer consideration of the process will explain this.

In my former treatise I adduced two experiments in demonstration of the assumed law. In the first essay, the proportions of the diameters of the windings were $= 0'', 73 : 6'', 57$; on the second, $0'' 73 : 28'', 0$. I will confine myself to the last, in which the proportion of diameters was as $1 : 40$; what is admitted of this, is allowable in a yet greater degree of the other, in which the proportion was only $= 1 : 9$. The induction of the streams in those spirals was so managed, that the spiral of $28''$ diameter, consisting of six windings, which had been wound closely together round a wheel of this diameter, and drawn on to an iron cylinder of about half an inch in diameter and two inches long, at the end of which two powerful magnetic systems were placed, so that the iron cylinder became highly magnetized, and on the sudden removal of these two systems, the stream was generated in the spiral. Thus the two systems, each of which being $19\frac{1}{2}$ inches long, placed in opposition with the cylinder, formed a magnet 41 inches in length, round which the spiral wound, its distance from the same being only 14 inches; the angle therefore described by man was of 112° . On the sudden withdrawal of the two systems, the magnetism of this entire angle is preserved; and not only the 2-inch iron cylinder, but also the two $19\frac{1}{2}$ -inch magnets act upon the spirals. We therefore find why the imperfect co-operation of the end of wider spirals did not show, if we admit that active magnetic elements existed within the angle of 112° , which is certainly most probable.

After these explanations I must hence modify (as being assumed *too general* in the treatise alluded to) the law presuming the electro-motive power of the magneto-electric streams independent of the diameter of the spiral windings. It becomes therefore necessary to qualify by saying, *that it is only effective generally when the inducing magnetic rods are to be considered with respect to the width of the spiral windings as interminable, but that upon short magnetic rods the limitation exists; that the comparison of the effects of spirals of different degrees of diameter is in favor of the less.*

Precisely the same remarks, which I have just made upon the width of the windings of magneto-electric spirals, are applicable to the other law presumed by me in the treatise already quoted; that the electro-motive power in the magneto-electric spirals is proportionable to the number of the windings. Also here, in the case of the shorter inducing magnets, must the end windings evolve a somewhat smaller electro-motive power. The reason why this was not shown in my former experiments was partly attributable to the spiral closely surrounding the iron cylinder, and partly to the circumstance of the windings being affected not only by the abstraction of the magnetism of the iron cylinder, but also by the removal of magnets of horse-shoe iron, whereby the inducing magnet is, as it were, lengthened. It is not necessary to enter further into detail in this case, as it is entirely analogous with that just considered, only a horse-shoe iron magnet is employed instead of the two rectilinear systems.

Thus even here is it requisite to modify the law, which assumes that the electro-motive power is proportionable to the number of the windings, as, strictly speaking, it is only cognizable when such magnets are employed as, in proportion to the width of the windings, may be considered interminable. It would be better expressed thus: The electro-motive power of a charged spiral is equal to the sum of the electro-motive powers of single windings collectively.

Poggendorf's *Annalen der Physik*.

Ancient Inks—According to the Roman naturalist Pliny, and other authors, the basis of the ink used by ancient writers, was formed of lamp-black, or the black taken from burnt ivory, and soot from furnaces and baths. Some have also supposed that the black liquor which the cuttle-fish yields was frequently employed. One thing is certain, that whatever were the component ingredients, from the blackness and solidity in the most ancient manuscripts, from an inkstand found at Herculaneum, in which the ink appears as a thick oil, and from chemical analysis, the ink of antiquity was much more opaque, as well as encaustic, than that which is used in modern times. Inks of different colors were much in vogue: red, purple, blue, and gold and silver inks, were the principal varieties. The red was made from vermillion, cinabar, and carmine; the purple, from the murex, one kind of which, called the purple encaustic, was appropriated to the exclusive use of the emperors. Golden ink was much more popular amongst the Greeks than amongst the Romans. During the middle or dark ages, the manufacture both of it and of silver ink was an extensive and lucrative branch of trade, and the illuminated manuscripts which remain are a striking proof of the high degree of perfection to which the art was carried.

The making of the inks themselves was a distinct business; another connected with it, and to which it owed its origin, was that of inscribing the titles, capitals, as well as emphatic words, in colored, and gold and silver inks.

Ayr Courier.

On the separation of Lime from Magnesia, and on the assay of Gold.
By Lewis Thompson, Esq. M.R.S.C. Communicated by the author.

TO SEPARATE LIME FROM MAGNESIA.

Dissolve the combined earths in dilute nitric or muriatic acid, and precipitate the filtered solution by means of an excess of carbonate of soda; dry the precipitate, and place it in a coated green glass tube, so disposed that the whole can be heated to a dull red heat; when red hot, pass a current of well-washed chlorine through the tube for a few minutes: the lime will be converted into chloride of calcium, but the magnesia remains unacted upon. When the whole is cool, remove the mass from the tube, and boil it for a minute or two in water, filter the liquid, and wash the insoluble portion (which is magnesia) with water, and precipitate the lime from the mixed liquors by carbonate of soda. The heat should not exceed a dull red, as the mass is apt to become vitrified at the part which touches the tube, and this renders it difficult to remove the contents.

TO ASSAY GOLD.

Take six grains of the gold to be assayed, and place it in a small crucible, with 15 grains of silver, and from 8 to 12 grains of chloride of silver, according to the supposed impurity of the gold; lastly, add 50 grains of common salt, (chloride of sodium) reduced to a fine powder, so as to prevent decrepitation; fuse the whole together for five minutes, and allow it to become cold; then take out the metallic button and beat it into a thin plate, and subject it to the action of dilute nitric acid as in the ordinary mode of parting. By this plan, the tedious process of cupellation is avoided, the baser metals being wholly removed by the chlorine of the chloride of silver, and their place supplied by pure silver.

Philosophical Mag.

Report on an improved process for the calcination of Copper Ores.—At the request of Messrs. Benson, Logan & Co. we attended at their copper works, near Swansea, to examine the working of Mr. Throughton's patented mode of calcining copper ore, and preventing those prejudicial effects which result to vegetation from the method hitherto generally adopted of calcining the ore in reverberatory furnaces, and permitting the whole of the gases and vapors to pass into the atmosphere.

Mr. Throughton's plan, as patented, consists of calcining copper ore in retorts, which are heated externally: by this arrangement, the gases and vapors from the ore are kept separate from the products of the combustion of the fuel, and can be treated with water to condense them without interfering with the draught of the furnaces.

We found that the calciner in operation was fitted up on a practical scale, and we were informed that it had been in use for the last two years, during which time it had required little or no repair. It consisted of twelve earthenware retorts, and four small furnaces, the heat

of which passed first along the under sides or surfaces of the retorts, and afterwards over the upper surfaces, thus heating them below and above in a very equal and effectual manner, from which circumstance the operation of calcining occupies only six hours for each charge. The twelve retorts are capable of receiving about two to two and a quarter tons of copper ore at once; consequently the twelve retorts calcine from eight to nine tons of ore in twenty-four hours. For this we found that free burning coal alone was sufficient, and that the consumption for eight to nine tons of ore was thirteen cwt.; whereas, we are informed, that, according to the present method of using reverberatory furnaces, for each eight tons of ore calcined, from thirty to thirty-five cwt. of coal, of which two-thirds are free burning, and one-third binding, are consumed. The patented plan, therefore, offers considerable advantages in saving fuel, as well as in its more immediate object, that of preventing the injurious effects produced by sending immense quantities of sulphuric and sulphurous acids into the atmosphere.

The mixed ore used in our trial consisted of one-third Connoree, one-third Knockmahon, and one-third Cornish. It was subjected to analysis, and found to consist of very nearly—

Copper	9
Iron	20
Sulphur	14
Oxygen, earthy matter, and arsenic . . .	57—100

On analyzing the ore, after calcination, it yielded about 10 per cent of sulphur, 4 per cent having been driven off in the operation, consequently, eight tons of the ore would have lost above 700 lbs. of sulphur, and this, according to the common mode of calcination, would have been thrown into the atmosphere in the forms of sulphurous and sulphuric acid; and a quantity of these, amounting to more than 1500 lbs. must be spread over the surrounding country in twenty-four hours from the quantity of ore specified. So powerful is the effect of these vapors, that it is impossible to respire for a moment air in which they are diffused even in very minute quantity; but it was proved that the gaseous products from the retorts, after being acted on by water, according to Mr. Throughton's plan, were quite innoxious, and might be breathed with impunity, several persons having, in our presence, introduced their heads into the flue through which the purified air was passing, and kept them there for a considerable time without suffering the slightest inconvenience.* The ore used contained some arsenic, which was volatilized with the sulphur; and as the vapor of arsenic is more readily acted on than the acids of sulphur by water, it could not escape when they were condensed.

We may here observe, that we are aware the condensation of the sulphurous vapors from copper ore has been before attempted, by submitting the products of combustion, together with those of the calcination of the ore, to the action of the water; but we believe that it would be impossible to use sufficient water for such a purpose without injuring the draught of the furnaces, in addition to the much greater

* Among others, Mr. Phillips repeatedly and successfully made trial of this very efficient test of the absence of sulphurous acid, and could scarcely perceive a trace of it, and was satisfied no appreciable quantity escapes into the air.

expense which would be incurred by having to act on a so much larger quantity of heated air.

In the patent plan, however, this defect is remedied, by conveying the products of the combustion of the coal through a different flue from that which conveys away the vapors evolved from the copper ore; and while water is thus effectually applied to the latter in its particular channel, the draught of the furnaces and of the flues which conduct the coal-smoke is wholly unimpeded by it.

It is well known that the chimneys of the calcining furnaces emit a very large quantity of white vapor, which is in fact sulphuric acid; but it is to be observed, that the sulphurous acid, which is invisible, also produces destructive effects upon vegetation, for it is not only injurious in itself, but by exposure to air and moisture, it is converted into the more powerful sulphuric acid. Great, therefore, as is the damage produced by the sulphuric acid, that resulting from the sulphurous acid must be still greater.

On analyzing the vapors of the copper ore, it appeared that the proportion of sulphurous acid was to that of the sulphuric acid upwards of three to one.

The quantity of water used in condensing the vapors from the copper ore, as practised according to the patented plan, was found to be at the rate of $13\frac{1}{2}$ cubic feet, or about 837 lbs. per minute.

This quantity might be greatly diminished by an improvement which has been suggested in the mechanical mode of its application; and it should be remarked, that the water is so very slightly impregnated with the acid vapors, that it may be again and immediately employed in a succession of apparatus for washing and condensing additional quantities of vapors from other retorts.

The quantity of water employed will, we conceive, be found to be objectionable, as a small portion only of the fuel saved in the process of calcination will be required to obtain the steam power necessary to keep up the supply; for it will be seen that, even supposing that the 837 lbs. of water per minute were not used a second time, and admitting it would be necessary to raise the water fifteen feet, each furnace capable of calcining eight tons of ore in twenty-four hours, would require a power rather exceeding one-third of a horse power, and taking a consumption of ten lbs. of coals for each horse power per hour, there would have to be deducted from the coal saved in the process of calcination about 90 lbs. for the power required to supply the water. We have supposed it requisite to raise the water fifteen feet, because we consider that to be an extreme case; but, probably, in many instances, a direct flow might be obtained; and we would also state, that we conceive there is no objection to the use of sea-water.

After the most careful consideration of the subject, we are of opinion that the invention is new, and decidedly successful, and that it is not only deserving the attention of the owners of copper works, as offering an economical mode of carrying on the process of calcining copper ore, but that it is also of the highest importance to the land-owners and the public in the vicinity of copper works.

R. PHILLIPS, *Mus. of Econ. Geol.*
W. CARPMAEL.

Important Discovery in the Art of Printing.—A few weeks ago it was announced, through the medium of the public journals, that a new and important process of transfer printing, which bids fair to revolutionize a large portion of the printing and publishing world, had been discovered by the Messrs. Dupont, of Paris. By means of this new process, copies of old or new books, engravings, &c. can be multiplied, it is said, to any number. This is effected by spreading a secret composition over the page or engraving of which copies are wanted, which is then laid face downward on the lithographic stone, and by a powerful pressure the stone retains, “with scrupulous precision,” the printed characters of the original page or engraving. “It is then covered,” says the account, “with the same preparation, and it may then print thousands of copies by the ordinary processes of every sort of lithography. Five minutes suffice for both operations. The original engraving may be restored to the portfolio which supplied it, for it has not been in the slightest degree injured: the book, thus wholly reprinted, may undergo another binding, and honorably resume its place in your library.”

The page of a book, newspaper, or an engraving, while the oily ink is still wet, but *only then*, can be transferred to stone, and by this means reproduced to any number. This is practised in many places by lithographers; but hitherto it has been found impracticable to transfer prints after the ink or oily substance has evaporated. Now that the discovery of the Messrs. Dupont has been announced to the world, we can confidently promise them a tough rival in the person of our townsman, Mr. Ambrose Blacklock, surgeon, whose dexterity in similar manual departments, as well as in others of a different nature, are well known, not only “hereabouts,” but “far awa’.” For a certain period past, his attention has been particularly directed towards discovering and perfecting a method by which the certainty of this extraordinary and important art may be secured. The idea and discovery originated entirely in his own mind; and, although at an early progress of his experiments doubts were expressed as to their ultimate success, scarcely any such can *now* be entertained—the specimens we have seen being so accurately delineated as regards body and outline, with the exception of a small proportion of what is termed by the profession *blurring*, that we can safely assert, that the art, in Mr. Blacklock’s management, has already almost arrived at perfection. How far the art itself may go when once placed in the hands of persons of professional experience—Mr. Blacklock, we believe, possessing no more of this than what was necessary in working out his own ideas—we will not venture to speculate; but at present we can confidently say, that the infant art presents high promise of future excellence. The effects of this discovery, to speak without exaggerating, can scarcely fail to be astonishing, considering the real cheapness of many of our present reprints; but on this point we will allow Mr. Blacklock to speak for himself:

“I believe—but my specimens must speak for themselves—that I have already brought this novel and important art to perfection; and it is quite impossible to foresee its effects upon literature and the fine arts. Foreign works and engravings may, in this manner, be reprinted on their arrival here, without the expense of setting up types or engraving

plates. In the same way our own books, the copyright of which has expired, may be re-issued at a rate which the cheapest of our reprints would fail to compete with. Bibles, &c. in the Indian languages, and in others whose character are so *outré* as to defy the art of the type-cutter, might, when once printed by the ordinary process of lithography, be reproduced so readily as to make the want of type a matter of little moment. Considerable benefit will, in all probability, accrue to our potteries. At present the number of designs which ornament the wares is very limited, as the engraved plates from which the recent impressions are transferred to the biscuit are so high-priced that a great variety of them cannot be kept by the china manufacturer. But, desirable as it may be when applied as above mentioned, I think it will be found of still greater importance in reprinting logarithmic tables, and other sets of calculations, on the accuracy of which, when applied to navigation, thousands of lives, and the security of so much valuable property, constantly depend."

Since writing the above, we learn that a number of scientific gentlemen and others are now turning their attention to this new discovery; and so great is the interest already excited, that many of our first lithographers are on the eve of negotiating with Mr. Blacklock for the disclosure of his magic composition. That such would very early be the case, we never doubted; and when once the enterprise and practical ingenuity of our mechanists have laid hold of the secret, it will not be long ere we have first-rate specimens of it placed before the public.

Dumfries Courier.

Anticipated results from the Daguerreotype.—What we may yet expect from the Daguerreotype is finely shown by the philosophic Arago: To copy the millions and millions of hieroglyphics, which entirely cover the exteriors of the great monuments at Thebes, Memphis, Carnac, &c. would require scores of years, and legions of artists. With the Daguerreotype, a single man would suffice to bring to a happy conclusion this vast labor. Arm the Egyptian Institute with two or three of Daguerre's instruments, and on several of the large engravings in that celebrated work, the fruit of our immortal expedition, vast assemblages of real hieroglyphics would replace fictitious or purely conventional characters. At the same time, these designs shall incomparably surpass, in fidelity and in truth of local color, the works of the ablest artists. Again, these photographic delineations having been subjected, during their formation, to the rules of geometry, shall enable us, with the aid of a few simple data, to ascertain the exact dimensions of the most elevated parts, and of the most inaccessible edifices. The preparation employed by M. Daguerre is a re-agent much more sensible to the action of light than any other hitherto in use. Never have the rays of the moon, we do not say in a natural state, but even when concentrated by the most powerful lens, or in the focus of the largest reflector, been capable of producing any perceptible physical effect. The plated discs prepared by M. Daguerre, on the contrary, receive impressions from the action of the lunar rays and the succeeding operations to such an extent as permits the hope that we shall be in a situation to make photographic charts of our satellite. In other words, in a few minutes we shall be able to execute one of the longest, most tedious,

and delicate operations of astronomy. Let us not hesitate, then, to announce the fact, that the re-agents discovered by M. Daguerre will speed onwards the progress of those sciences which confer the highest honor on the human mind. By their aid, the philosopher will be enabled henceforth to proceed on the principle of absolute intensities; he will compare lights by their effects. If he find it useful, the same tablet will present him with the impression of the dazzling beams of the sun, and with the penciling of rays three hundred thousand times fainter than these of the moon—the rays of the stars. In short, when observers apply a new instrument to the study of nature, what they expected from it has always proved little indeed, compared with the series of discoveries which the instrument originated. In this instance, it is upon the unforeseen that we are especially to reckon.

Improvement in the manufacture of Iron.—The particulars of an improved process in the manufacture of iron are given below from the specification of the patentee, Mr. Heath. Every proposition which bears upon this great manufacture is, of course, deserving of notice, and we shall be glad to receive further particulars of this new process, which has the novel feature of dispensing with the use of fluxes altogether.

Josiah Marshall Heath, Allan Terrace, Kensington, for certain improvements in the manufacture of iron and steel: Oct. 4th. This invention consists, first, in the extraction of pure cast iron from the ore, without the intervention of any earthy, alkaline, or saline matter, to form a vitreous flux, cinder or slag; second, in producing cast steel by fusing pure cast iron so obtained, along with malleable iron, or certain metallic oxides, in such proportions as may decarburate the cast iron to a certain degree; and in carrying the process of decarburation to the further extent desired, by cementation with metallic oxides, without any admixture of carbonaceous matter; third, in the use of oxide of manganese, without mixture of any other substance, in the process of converting cast into malleable iron, by the process of puddling; and fourth, in the use of carburet of manganese to make common blistered steel into cast steel.

Malleable iron is at present produced either by smelting the richer iron ores with just as much charcoal or other carbonaceous matter as is adequate to abstract all the oxygen from the ore, and bring the ore into the malleable state; or by smelting the poorer ores, called “iron-stones,” in contact with carbonaceous matter, in such excess as to form with the metal the compound called carburet of iron by chemists, and cast iron by manufacturers; and then separating the carbon by a distinct and subsequent process. By the first process, malleable iron of very unequal quality in its different parts is produced; and by the second process, a cast iron is obtained, which is contaminated to a very considerable degree with sulphur, phosphorus, arsenic, silicon, aluminum, calcium, and other foreign substances. A pure native oxide, or carbonate of iron, is alone capable of producing a pure metal convertible into good steel; but such pure ore has been hitherto debased and deteriorated in the smelting, by mixture with earthy, saline, or alkaline matters, under the name of fluxes, added with the intention of promoting

the reduction of the metal, and of protecting it when reduced from the oxidizing influence of the blast.

After an extensive course of experiments, Mr. Heath has discovered that such earthy fluxes are not necessary. His operation is commenced by charging the blast furnace successively with coke, charcoal, or other suitable fuel, leaving the tap hole open that the flame of the fuel, urged by the blast, may play in all directions, so as to bring the whole interior of the furnace into an uniform state of incandescence. When the furnace is thus charged, the tap hole is closed, and 20 lbs. of ore are thrown into the furnace for every 100 lbs. of fuel. The furnace is charged at this rate for about twelve hours, when the melted metal is run off into pigs. After this first discharge or casting, the ore is added at the rate of 25 lbs. for every 100 lbs. of fuel, for a second period of twelve hours, when a second casting of pig iron is run off. After this second discharge, ore is added at the rate of 30 lbs. for every 100 lbs. of fuel, during a third working of twelve hours; and thus, in each successive period of twelve hours the quantity of ore is increased at the rate of 5 per cent. of the weight of the fuel, till eventually the proportion of ore amounts to about 65 or 70 lbs. for every 100 lbs. of fuel. By proceeding in this way, and by throwing in the ore merely reduced to the size of peas, or thereabouts, but not roasted, if the furnace be well attended to by the workmen, it will turn out about 50 lbs. of pure pig iron for every 100 lbs. of fuel consumed.

To convert the carburet or cast iron, thus produced, into steel of any degree of hardness, it is melted in a cast iron or cupola furnace, by the heat of coke or other fuel; but, in all cases, no more fuel is used than is requisite to melt the iron, so, that the oxygen of the blast shall serve to burn away the carbon of the carburet to a considerable degree, while a further portion of the carbon is neutralized or removed by the addition of scraps of metallic iron, or by the oxides of iron or of manganese.

To produce a superior cast steel from the pure cast iron, sesquioxide of manganese, which has been previously ignited, is introduced in quantities not exceeding 5 per cent. into the cupola; no more fuel is used than the blast can readily burn into carbonic acid, otherwise the excess of the carbonaceous flux would deoxidize the manganese, nullify its decarburetted action upon the cast iron, and thus prevent it from reducing the metal to that lower stage of carburet which constitutes cast steel. Sometimes, for the same decarburetted purpose, a portion not exceeding 5 per cent. of chromic ore may be used. When the decarburation has been carried in the cupola, to the proper pitch, the steely metal is to be run out, and cast into iron moulds. The ingots thereby formed are now to be converted into steel of any desired degree of mildness by a further process of decarburation, which consists in stratifying the said ingots along with peroxide of iron, or peroxide of manganese, without charcoal, in a steel cementing furnace, which should be lined with sheet iron, if it is constructed of fire bricks or stone, to prevent the action of the peroxides upon the stones or bricks of the furnace. The ingots are to be here subjected to a cementing heat for a certain period, proportional in duration to the softness required in the metal.

Mr. Heath further improves the quality of malleable or bar iron, by adding to the pig or plate iron in the puddling furnace, while in fusion,

from one to five per cent. or thereabouts, of any pure oxide of manganese, the sesquioxide being preferred.

An improved quality of cast steel is made by putting into a crucible bars of common blistered steel, broken as usual into fragments, along with from one to three per cent. of their weight of carburet of manganese, and exposing the crucible to the proper heat for melting the materials, which are, when fluid, to be poured into an ingot mould in the usual manner.

Mining Journal.

Civil Engineering.—It appears that before the University of Durham (which, by the way, is one of the most deserving public institutions in the country) made civil engineering a part of its studies, a college of civil engineers had been commenced in London. Mr. Wallace, of Blythswood Hill Academy, whose lucubrations we have often seen with much effect in the Glasgow Chronicle, has recently addressed a letter to that journal, in which he enters with his well-known spirit and learning into this subject. He shows how important it is in connection with steam, and that some of the old institutions in Scotland are arranging courses of lectures upon engineering separately from their usual classes. But the most useful point in which we view this institution is from the principle laid down of allowing parents to pay a small annuity for a pupil at any age below 14, and that he shall be admitted at that age for five years at least *free of charge*. There is also to be an evening class for the benefit of working engineers; and out of this class, we presume, ten young men, who have displayed extraordinary ability, are to be periodically selected to enjoy the whole advantages of the institution. This sort of institution, and the more practical branches taught at Durham and at the London University, will soon work a strange and probably unexpected reformation in the old nests of classics and debauchery, mathematics and corruption, at Oxford and Cambridge. Indeed, we consider such an institution much better than if professorships should be established in separate institutions. There will be a concentration and an interest in such a gathering together of eminent youths in the metropolis, as well as a degree of emulation, and an excelling of each other, which never could have occurred in institutions where there were merely professorships. Besides, let it be observed that all usual learning is to be taught, the only difference being that practical science is to be the leader, not—as in most other institutions—the follower.

Tyne Mercury.

March of Intellect.—The catalogue of this autumn's book-fair, at Leipsic, which may be regarded as a fair index of the literary and scientific activity in Germany, during the last six months, announces 4071 new works published by 518 booksellers. The number published in the summer half-year of 1829, was about 3000, and that of the corresponding period in 1819, only 1300. It is said, in a letter from Leipsic, that this increase, judging from the business which is doing by printers and booksellers, will still go on in a similar proportion.

Gunpowder.—Before the invention of gunpowder the number of castles, erected chiefly as places of security, was very great; but since,

few have been built, and these have not been as places of defence. There were 1,100 castles built in England between the years 1140 and 1154.

Fuel for Steam purposes.—A new description of fuel for steam purposes has lately been invented by Mr. Stirling, of Limehouse; and an experiment to prove its superiority over even the best Welsh coals, was made last Saturday, at the furnaces of Messrs. Fairbairn, engineers, at Mill Wall, Bankside, London, under a high pressure engine, during the long period of eleven hours, with the most perfect success. The saving in fuel alone was not less than twenty per cent. in comparison with that description of the best coals commonly used in the works of these gentlemen; and the space occupied by Mr. Stirling's fuel was also one third less than that usually set aside for coals. The Lords of the Admiralty have directed another experiment to be made of the properties of this fuel, at Deptford; and, should it be equally successful, a new era will speedily be created in steam navigation; the superiority of Mr. Stirling's invention being made manifest in a considerable saving in expense, in the creation of a much more powerful heat than can be raised from coals, and, what is still more important, in an immense saving of room on board ship.

Mining Journal.

NOTICES OF NEW PUBLICATIONS.

The American Farmers' Companion.—This work, devoted as the name indicates to the farming interests of our country, is published monthly by Messrs. Wilson and Rogers of Philadelphia. It is a valuable compendium upon agriculture and subjects immediately connected therewith, and its cheapness, which in these days should be rated a merit, places it within the reach of every tiller of the soil, whether farmer or farmer's laborer.

Silliman's Journal for January, February, and March, has been received. So high a character, has this periodical obtained that the only opinion respecting it, is, it would deserve, if it were not *above*, all praise. The present number contains many valuable additions to science and the arts, and one modest pleasing flower from the more genial walks of literature, which blooms *not* the less freshly because it inhabits a nook in

"The snow crowned peak of science."

We refer to the "account of the capture and death of an alligator," which, for happy description of incident and scenery, may vie with the best productions of its day.

The Scottish Patriot, is the title of a new candidate for public favor generally, and the favor of Scotia's sons especially. It is ably conducted, and has for one of its objects the advancement of the arts, manufactures, and science.

Hunt's Merchants' Magazine flags not in its efforts to serve the class whose interests it professes to advocate. Nor are these efforts vain, as its enriched pages will show on the one hand, while on the other may be seen a due share of substantial public favor, which is not merely a life but a soul.

UNITED STATES PATENT OFFICE.

We have been favored with a copy of the report of H. L. Ellsworth, Esq. Commissioner of Patents, made to the United States Senate, showing the operations of the office during the year 1839, from which we extract the following:

Four hundred and twenty-five patents have been issued during 1839, (including eight additional improvements to former patents.)

During the same period, three hundred and three patents have expired.

The receipts of office for 1839 amount to \$37,260, from which may be deducted \$5,769, paid on applications withdrawn.

The ordinary expenses of the Patent Office the past year, including payments for the library and agricultural statistics, were \$20,799 95, leaving a surplus of \$11,450 43 to be credited to the patent fund.

For the restoration of models, records, and drawings, under the act of 3d March, 1837, \$7,973 57 have been expended.

The receipts of the office would have been nearly \$2,000 more, had not the late law permitted assignments to be recorded without charge, a gratuity, however, which has given much satisfaction.

In compliance with the act of 3d of March, 1839, I have published a digest of all patents granted by the United States, adding thereto an alphabetical index, and shall deposite in the Library of Congress nine hundred copies of the same.

The old digest was very defective. A new arrangement has been made, giving to each invention its appropriate classification.

A distribution of the new digest, will materially lessen the correspondence of the office and guard citizens against the impositions of vendors of spurious patents. The volume contains above seven hundred and fifty pages.

The work was deemed necessary for daily reference in the office, and believing the appropriation adequate to cover the expenses, I did not delay the publication.

A small additional appropriation from the patent fund will be required to complete payment for the same.

Eleven thousand five hundred and nine patents have been issued by the United States previous to January, 1840.

A large number of applications, partially completed, are awaiting the reception of models and treasury fee.

The transmission of models through agents appointed by law in the several states affords much facility to inventors: and if permission were given to deposit with collectors of public revenue the fees required, such accommodations would obviate one cause of perplexity and delay, and be more especially convenient in consequence of their present agency in forwarding such models.

I am happy to say the Patent Office building is so far completed as to afford, within a few weeks, the necessary accommodation for the office, and to enable the commissioner to receive the numerous specimens of American art as contemplated by the act of reorganization, and to carry out the wishes of congress by collecting and distributing valuable seeds; exhibiting also, under appropriate classifications, the most important varieties, both exotic and indigenous.

The inquiries propounded by the honorable Secretary of State, in taking the next census, rendered it necessary for the Commissioner to expend but a small part of the appropriation for procuring agricultural statistics. From data of so high a source, the Commissioner can safely predicate future calculations, and hopes to present to Congress such details of domestic products, as will be of importance in financial estimates.

The diplomatic corps of the United States residing abroad, have been solicited to aid in procuring valuable seeds, and the officers of the navy, with the approbation of the honorable Secretary of that department, have been requested to convey to the Patent Office, for distribution, such seeds as may be offered. In many cases no charges will be made for seeds. If small expenses do arise, they can be reimbursed by appropriations from the patent fund, daily accumulating, and consecrated specially to the promotion of the arts and sciences.

The cheerfulness with which the diplomatic corps and the officers of the navy have received the request of this office, justify sanguine anticipations from this new undertaking.

With the additional assistance granted last session, and correspondent exertions on the part of those connected with the bureau, the business in each branch is brought up. Less delay will, I trust, arise in future applications.

The number of caveats issued in 1839 was two hundred and twenty-five.

The number of applications for patents the same year exceed eight hundred. One half of these have been rejected on examination. That the investigations of the office have not been conducted without care and attention, may perhaps be inferred from the fact that no appeal has been taken from the decision of the Commissioner on these cases. These rejections will show patentees, that they are protected from interference, to a great extent, and the public generally, how much they are guarded against useless or invalid patents.

I only add that a small appropriation will be required to continue present periodicals taken at the office, together with some additional standard works which are needed for daily reference.

LIST OF AMERICAN PATENTS,

Granted from March 25th, 1840, to April 11th, 1840.

- Orren McCluer*, Fredonia, N. Y. Improvement in Saddles. Patented March 25th, 1840.
- Baxter D. Whitney* and *George W. Lawton*, of Winchendon, Mass. Machine for stretching cloth in the process of fulling. March 25th, 1840.
- Edward Gray*, of Ulysses, N. Y. Improvement in the Grist Mill. March 25th, 1840.
- John S. Gilbert*, New-York. Improvement in the Floating Dry Dock. March 25th, 1840.
- Edward Robbins* and *William Ashby*, Bordentown, N. J. Improvement in Water Wheels. March 25th, 1840.
- Mahlon Gregg*, Philadelphia, Pa. Improvement in Bedsteads. March 25th, 1840.
- William Bryant*, Davidson county, Tenn. Improvement in Ploughs. March 31st, 1840.
- Joseph Bolton Doe*, London, England. Improvement in Soap-Frames. March 31st, 1840.
- Charles Lombaert* Philadelphia, Pa. Improvement in Machines for removing snow from railroad tracks. March 31st, 1840.
- Samuel H. Bean*, Philadelphia, Pa. Improvement in the Rocking Chair. March 31st, 1840.
- Sands Olcott*, New Hope, Pa. Mode of preparing flax and hemp, preparatory to the various processes of cleaning and separating the fibres, &c. March 31st, 1840.
- Ezra R. Benton*, Ohio City, Ohio. Mode of constructing bails and drivers for grist-mills. March 31st, 1840.
- Daniel Treudwell*, Cambridge, Mass. Improvement in the condensing apparatus for steam-engines. March 31st, 1840.
- James N. Troville*, Christiansburgh, Va. Mode of preparing white-lead paint. March 31st, 1840.
- Jacob B. Eversole*, St. Louis, Missouri. Improvement in steam boilers. March 31st, 1840.
- Miles C. Mix*, Tompkins county, N. Y. Machinery for removing stumps and other heavy bodies. March 31st, 1840.
- Jesse Hubbard*, Watertown, Conn. Mode of oiling and protecting mill spindles from dirt. April 8th, 1840.
- Samuel Talbott*, Richmond, Va. Improvement in brick machines. April 8th, 1840.
- John Scott*, Philadelphia, Pa. Improvement in Stoves. April 8th, 1840.
- Samuel Moore*, Chambersburgh, Pa. Self-regulating and self-oiling mill-bush April 8th, 1840.
- William Dripps*, Coatesville, Pa. Improvement in chairs for holding the rails of railroads. April 8th, 1840.

- Jonathan Knodle*, Bakersville, Md. Improvement in constructing combined ploughs. April 8th, 1840.
- George Stocker* and *Joseph Bentley*, Birmingham, England. Improvement in fire-arms. April 8th, 1840.
- Abel Post*, Henrietta, N. Y. Improvement in the breast-plate harness for horses. April 8th, 1840.
- Chauncey Crain* and *Evert L. Wemple*, Madison, N. Y. Platform Balances. April 8th, 1840.
- Asa Copeland*, Bridgewater, Mass. Improvement in Cotton Gins. April 8th, 1840.
- John L. Clarke*, Nashua, N. H. Improvement in brakes for railroad carriages. April 11th, 1840.
- Sands Olcott*, Philadelphia, Pa. Machine for washing and cleansing various descriptions of yarn. April 11th, 1840.
- Sands Olcott*, Philadelphia, Pa. Machine for reducing the fibres of flax and hemp to a uniform length, so as to enable them to be spun with facility. April 11th, 1840.

DESCRIPTION OF PATENTS.

Improvement in the Construction of Saddles. By ORREN MCCLUER.

CLAIM.—“What I claim as my invention, and desire to secure by letters patent, is the manner of attaching the leather or other covering of the seat of the saddle, (Fig. 1,) to the bow, (Let. A,) or to the straining web, (Let. C,) and extending a flap of leather, being of the same piece with the skirt, (Fig. 2,) from the pommel or head of the saddle, (Fig. 4,) so as to lap over the foregoing cover, by which means the whole weight of the rider rests entirely upon the spring; while in ordinary saddles, where the leather covering extends over the whole saddle, the weight is supported by the leather in a great measure, so that the spring does not operate as well, the whole being constructed as herein described.”

Improvement in the Machine for Stretching Cloth in the Process of Fulling. By BAXTER D. WHITNEY and G. W. LAWTON.

CLAIM.—“We claim stretching the cloth width-wise, during the process of fulling, or after it is fulled and steamed, by means of the right and left threaded screws, D E, E F, (Plate 2, Fig. 1,) or fluted segments G, H, I, K, (Plate 2, Fig. 2,) in manner as above described.”

Improvement in the Grist-Mill. By EDWARD GRAY.

CLAIM.—“What I claim as my invention, and desire to secure by letters patent, is placing a pair of small stones in the eye of the runner, turning in opposite directions to each other, for grinding quicker near the centre, and thus preparing the grain for the large stones, which are thereby enabled to grind it into flour more easily and expeditiously, than without such previous preparation as herein described.”

Improvement in the Floating Dry Dock. By JOHN S. GILBERT.

CLAIM.—“First. The employment of a boat-gate, in the manner described, for the purpose of dividing the machine into two compartments, in the manner and for the purpose described.

“Secondly. The manner of employing moveable loaded or ballast cars, which are made to run upon suitable rails or ways, situated on the platform, extended out for that purpose, in order to regulate the centre of gravity of the apparatus, as described.

“Thirdly. The particular manner of uniting or putting together the timbers of uniform size, for the construction of the platform and of the sides of the dock, which saves the expense of building stages, as set forth and represented in Fig. 7, whether said sides be made stationary or moveable.”

Improvement in the Construction of Water Wheels.

By EDWARD ROBBINS and WILLIAM ASHBY.

CLAIM.—“What we claim, therefore, as of our invention, and desire to secure by letters patent, is the employment of valves in buckets of water-wheels, such valves having the position herein described and represented in the accompanying drawing, and being used in combination with the openings through the soling of the wheel; that is to say, said valves forming an angle of 130° , more or less, with the radiating buckets, or with the radii of the wheel, and closing against its soling immediately above the openings for the escape of air; the whole being constructed and operating substantially in the manner set forth.”

Improvements in the manner of fastening Bedsteads, and attaching and stretching Sackings. By MAHLON GREGG.

CLAIM.—“What I claim therein as constituting my invention, and desire to secure by letters patent, is the particular way in which I form the tenons on the rails, and the mortises in the posts, out of the solid material, as set forth, so that the respective parts are put together and tightened in the manner described. I also claim the manner of attaching and tightening the sacking bottom, by means of separate sacking rails, drawn up at the sides by means of thumb-screws, the sacking being at the same time stretched lengthwise by the bearing of the ends of the side-rails against the inclined planes of the end-rails; the whole constructed and operating substantially as set forth.”

Improvement in Ploughs. By WILLIAM BRYANT.

CLAIM.—“What I claim as my invention, and desire to secure by letters patent, is the fixing in the plough, a coulter behind the share or cutting part, which coulter steadies the plough, and loosens the earth lower than the share cuts.”

Improvement in Candlesticks. By WILLIAM CHURCH.

CLAIM.—“I desire it to be understood that I claim as one of the features of this invention of improvements in candlesticks, an elastic holder for the candle, connected to the socket, by whatever means and however formed.”

Improvements in the construction of Soap-Frames.

By JOSEPH BOLTON DOE.

CLAIM.—“What I claim as constituting my improvement in soap-frames, is the constructing of such frames, from metal or other material which is a good conductor of heat, in the manner herein described; that is to say, by making them in one entire frame, (in lieu of in separate frames placed over each other) and having moveable sides and ends secured together by bolts or other analogous devices, substantially as herein set forth.”

Improvement in machines for removing Snow from Railroad Tracks.

By CHARLES LOMBAERT.

CLAIM.—“What I claim as my invention, and desire to secure by letters patent, is the method of dividing and removing snow on railroad tracks, &c. by means of an inclined plane, constructed with sides, as herein set forth, and of conducting the same from the machine by means of the raised platform, triangular frame, and wings *g g*, in combination with the foregoing arrangement; the whole being constructed and operating substantially as herein set forth.”

Improvement in the Rocking Chair. By SAMUEL H. BEAN.

CLAIM.—“What I claim as my invention and desire to secure by letters patent consists in making the seat and stool of the chair in two parts so that the seat shall rock on the top of the stool, instead of having the parts permanently united, with rockers on the legs of the stool as heretofore; and also the mode of connecting together the seat and stool by the vertical plates attached to the seat passing through the stool with shoulders projecting from the sides thereof which catch against the under side of the stool when the seat is rocked to and fro; and likewise the manner of reclining the back of the seat at any angle required by the lock plates and notches in the hanging plates which receive them as before described.”

Improvement in the mode of preparing Flax and Hemp preparatory to the various processes of cleaning and separating the fibres, &c.

By SANDS OLCOTT.

CLAIM.—“What I claim as *new* and as *my* invention and desire to secure by letters patent, is the shape in which I place the material to be worked, or in other words, the conversion of hemp or flax to be acted on, into an *Endless Rove or Belt*, so that it may continue to pass in and out of the machinery after the manner of a belt.”

Improvement in the mode of constructing Bails and Drivers for Grist-Mills. By EZRA R. BENTON.

CLAIM.—“What I claim as my invention, and desire to secure by letters patent, is the constructing the bail and driver with corresponding prongs and depressions, as shown at C D C, Fig. 3, and J J J, Fig. 1, constituting a three-bearing coupling, and E F, Fig. 4, and K L, Fig.

2, constituting a two-bearing coupling, connectively shown at Figs. 6 and 7; said couplings being on a level, or nearly so, with the hemispherical depression in the centre of the bail. Thus coupling the bail and driver together, at or nearly the same distance from the face of the stone with the point of the spindle on which the stone is suspended and balanced, in the manner herein set forth. I also claim the giving the rounding or head form to the sides of the square H of the spindle, for the purpose of enabling it to move freely within the mortise G of the driver, notwithstanding any bending of the driver upon the spindle."

Improvement in the Condensing Apparatus of Steam-Engines.

By DANIEL TREADWELL.

CLAIM.—"My invention, for which I claim letters patent, consists in forming the condenser with curved pipes, as herein particularly described, which pipes pass from, and return to, the same plate, by which they are supported, and which plate covers the two cavities, into one of which the steam passes from the exhaust pipe of the engine, and the other receives the water formed by the condensed steam: this form of construction having the following advantages:—1. All the pipes are supported by the same body.—2. They are all opened to be cleaned, by a removal of the back plate.—3. They are free to expand and contract, without causing their ends to move.—4. The outside of the pipes are open and exposed, so that they can be cleaned without removing any part on which their support depends.—5. They are, by means of being secured by soldering to the plate, placed nearer together than in any other form of fixture."

Improvement in the mode of preparing White-Lead Paint.

By JAMES N. TROVILLS.

CLAIM.—"I do not claim to be the first to have incorporated linseed oil and water together in the preparation of paint, with a view to economy in the use of the former article, this having been done by the aid of lime or other alkaline substances; but what I do claim, is the producing of this combination by the agency of white lead alone, substantially in the manner above set forth, for the purpose of producing a mixture to be employed as a paint, applicable to all the objects to which white lead is ordinarily applied."

Improvement in Steam Boilers. By JACOB B. EVERSOLE.

CLAIM.—"What I claim as my invention, and which I desire to secure by letters patent, consists in placing the segment guard or partition between the flue and bottom of the boiler, so as to ward off the steam generated on the bottom of the boiler, and direct it upward, without touching the bottom of the flue, as before described."

Improvement in Machinery for Removing Stumps and other Heavy Bodies. By MILES C. MIX.

CLAIM.—"What I claim as my invention, is the particular manner of obtaining the power, by the construction and arrangement of the

gearing as herein set forth; that is to say, the mode of operating by two or more sets of double pinions on two differential wheels, through the intermedium and by means of an apparatus combined and connected substantially as herein set forth, for the purpose of removing stumps or other articles requiring great power, and to which such a machine is adapted."

Improvement in the mode of Oiling and Protecting Mill-Spindles from Dirt. By JESSE HUBBARD.

CLAIM.—"What I claim as my invention, and desire to secure by letters patent, is the mode of protecting the spindle of the mill from meal and dirt, by means of the protection collar and groove, and of oiling the spindle by means of a hole through the damsel, bail, and driver, as herein before described."

Improvement in Brick Machines. By SAMUEL TALBOTT.

CLAIM.—"What I claim as my invention, and desire to secure by letters patent, is the mode of producing the pressure on the piston E, by means of the lever H, operated by the cam J, in combination with the mode of operating the bed D, of the press for throwing up the bricks, when pressed by means of the lever L, operated by the cam K, the whole being constructed, arranged and operating as herein set forth. I also claim, in combination with the foregoing, the mode of operating the box F, and removing the bricks by the same. the box being operated by the forked lever o, moved by the cams q Q', all as herein set forth."

Improvement in Stoves. By JOHN SCOTT.

CLAIM.—"What I claim as my invention in the above described stove, and desire to secure by letters patent, is the manner in which I have combined and arranged the hopper, the drum, and the furnace; the whole apparatus being connected and combined substantially as herein set forth."

Improvement in the self-regulating and self-oiling Mill Bush.

By SAMUEL MOORE.

CLAIM.—"What I claim therein as constituting my invention, and which I desire to secure by letters patent, is the manner in which I have arranged and combined the double-faced brass boxes or oil-cups, with the nuts, studs, and springs, so as to operate upon the spindle, in the manner and for the purpose herein set forth."

Improvement in the mode of constructing Chairs for sustaining and holding the Rails for Railroads. By WILLIAM DRIPPS.

CLAIM.—"Having thus fully described the manner in which I construct my railroad chair, and shown how the same operates in producing the intended effect, what I claim therein as of my invention, and desire to secure by letters patent, is the particular combination of the respective parts thereof, constructed, formed, and operating substantially as set forth; that is to say, I claim the combination of the cheek-piece C C,

with the separate cheek-piece or casting E E, and the plate-wedge F F, producing their combined effect in the manner described."

Improvement in the mode of constructing Combined Ploughs.

By JONATHAN KNODLE.

CLAIM.—"What I do claim, is the using of several mould-boards of cast iron, of the ordinary construction of such mould-boards, but without land-sides, and the so arranging said mould-boards as that the point of either of those in the rear shall follow that which precedes it, within the width of its furrow-slice, in the manner and for the purpose herein set forth."

Improvement in Guns, Pistols, and other Fire-Arms.

By GEORGE STOCKER and JOSEPH BENTLEY.

CLAIM.—"We desire it to be understood that we do not claim all the parts which we have described in the foregoing; but what we do claim as our invention, and desire to secure by letters patent, are the following, namely:

"1. The manner in which we construct the explosion-chamber within the breech of fire-arms, or within the break-off, as set forth.

"2. The manner of constructing and arranging the cocking-lever with its lower end within the guard, said lever being combined with the other parts of the lock, as described.

"3. The manner of connecting the break-off, and the cock and trigger plates, by means of the screw, the connecting piece *w* and its appendages, substantially as set forth."

Improvement in the Breast-plate Harness for Horses. By ABEL POST.

CLAIM.—"What I claim as my invention, and desire to secure by letters patent, is the improvement to the common breast-collar by my clasp in front, and by substituting hames and pads as described, in the place of the neck strap to the English breast-collar."

Improvement in the construction of Platform Balances.

By CHAUNCEY CRAIN and E. L. WEMPLE.

CLAIM.—"What we claim as our invention, and desire to secure by letters patent, is the method of balancing the levers by means of the weight K suspended from the lever I, between the pendants M M, and adjusted by the screw L, the whole being constructed and operating in the manner set forth. We claim also forming the graduated lever with a clasp, to which the moveable weight is attached with pointers, to indicate by the lines on the lever the amount of weight on the platform."

Improvement in the manner of constructing and affixing the Ribs of Saw-Gins for ginning Cotton. By ASA COPELAND, JR.

CLAIM.—"What I claim as my invention and improvement in the constructing and affixing the ribs of saw-gins for the ginning of cotton, is the so forming and affixing them to the breast or grate-fall, as that their upper ends shall stand off from the front of said breast in the

manner herein described, in order to allow of a free and uninterrupted rise and escape of the fibres and seed, from the upper ends of said ribs; and this I claim, whether the said ribs be formed and attached precisely in the manner set forth, or in any other way which is substantially the same, and by which a like result is obtained."

Improvement in the Machinery for operating Friction Brakes for Railroad Cars. By JOHN L. CLARKE.

CLAIM.—"First. I claim arresting or retarding the progress of cars, while in motion on a railway, by a combination of rods F, G, H, I, K, L, connected with the friction brakes by the intervention of the toggles or progressive levers *g, h, i, j, k, l*, lever *d, e, f*, transverse beam D, or other suitable machinery, the whole arranged and operating by the momentum or power applied to the lever *b', c', d*, substantially in the manner and on the principles herein above described and represented in the different drawings.

"Second. I claim the method of connecting the rod F, G, and toggles *g, h*, by means of the combination of machinery, consisting of the dog or catch, *p', q'* attached to the rod F, G, piece of metal *r'* shaped and arranged together, and acting in connection with the levers *b', c', d', e', f', g'*, substantially as above described, for the purpose of operating the brakes of the tender by the momentum of the cars, whenever the same may be necessary or desirable."

Improvement in the Machine for Washing and Cleaning Yarn.

By SANDS OLCOTT.

CLAIM.—"What I claim as my invention, and desire to secure by letters patent is, the construction of a machine for washing yarn and other substances, by means of a series of pairs of fluted rollers, with flanges on one of each pair, in combination with the reservoir and trough, so that an endless skein can be passed continually through them, and at the same time be passing through the water or other liquid for washing, as herein described."

Machine for reducing the Fibres of Flax and Hemp.

By SANDS OLCOTT.

CLAIM.—"What I claim as my invention, and desire to secure by letters patent is, the combination of the gang of saws or rows of teeth on a cylinder, with the arrangement of cords and rollers for holding, guiding and working the flax or hemp in the manner herein described."

Improvement in the Floating Swing-Bridge. By JOHN N. VROOMAN.

CLAIM.—"What I claim as my invention, and desire to secure by letters patent, is the employment of a boat, float, scow or buoy, for the purpose of sustaining the swinging end of a bridge in the manner described. I also claim the arrangement of ropes or chains, by which the bridge can be opened or closed from either side of the canal or stream, as described, and in combination therewith, the latch for retaining the bridge in its place when thrown back, as described."

Improvement in the method of Oiling Horizontal Shafts and Axles.

By HIRAM M. SMITH.

CLAIM.—“What I claim as my invention, and desire to secure by letters patent, is the wheel B, working in an oil-cup, and in a sliding frame or gate, acted upon by a spring, which adapts itself to any irregularity of height the bearing is subject to, as herein described. I disclaim it as a friction roller, as I do not intend it to support the bearing, but merely to act as an oiler or feeder. I also claim the wiper and the gutters on each side of the bearing, in combination with the wheel, as herein described.”

Improvement in the manner of manufacturing Screw Augers.

By WILLIAM FIELD.

CLAIM.—“What I claim as my invention, and desire to secure by letters patent, is the forming the twist in screw-augers by means of swages or dies, constructed and operating substantially as herein set forth.”

Improvement in Cheese Presses. By RUFUS PORTER.

CLAIM.—“I claim as original, the mode of producing a pressure by means of the double levers, friction rollers, and swelled posts, as above described.”

Improvement in Bee-Hives. By MARTIN ENGEL.

CLAIM.—“What I do claim as my invention, and desire to secure by letters patent, is the manner in which I have combined and arranged the two inclined traveling planes, *b* and *d*, and the strips *g*, fig. 4, for the entrance of the bees, so as to form the abrupt turn, as shown in the drawings. I claim, in combination with said entrance, the closing slide *i*, shown in fig. 4. I claim also the manner of constructing and using the sliding frames, fig. 3, with their vertical rods, climbing or building sticks; and also the constructing of the horizontal grates in the manner and for the purpose set forth.”

Improvement in Tailors' Measuring Instruments.

By WILLIAM J. LEMMOND.

CLAIM.—“What I claim as my invention, and which I desire to secure by letters patent, consists in the combination of the horizontal graduated sliding strap No. 2, having graduated vertical sliding straps No. 4 upon it, with tape measures attached to them, with the graduated vertical strap B, and also the combination of the graduated horizontal strap No. 3, having vertical sliding pieces No. 5, with tape measures, attached to them with the vertical strap B; the whole being constructed and operating in the manner and for the purpose described.”

Improvement in the mode of measuring and drafting Garments.

By ISAIAH J. HENDRYX.

CLAIM.—“What I claim as my invention, and desire to secure by letters patent, is the mode of obtaining the backward or forward location

of the shoulder-strap and pitch of the shoulder seam, by means of a flexible square and protractor, applied and used in the manner herein set forth."

Improvements in the construction of Railroads. By JAMES HERRON.

CLAIM.—"What I claim as my invention, and desire to secure by letters patent, is:

"1. Placing the sills *a c a* and *b c b*, &c. Fig. 1, &c., A and B Fig. 29, 33 and 43, in the formation of a railway, so that they will cross each other in lines diagonal to the rail; and uniting them with each other and with the rails, so that they become struts and tie-braces to the track, substantially as set forth. And whereas, said brace-sills may be variously combined with each other, and with cross-sills, as at Figs. 33 &c., 44 &c., and 46 &c., and may be made to support an iron rail without the intervention of the timber string-pieces; and may also, like common sills, be placed on a 'mud sill.' I distinctly claim to be the inventor of the *braced sill*, or *lattice construction of railway tracks*, under the modifications set forth, together with such variations thereof as may produce a like result by means substantially the same. I thus, by the union in one, to an indefinite extent, of such materials as those that usually compose railway tracks, obtain by a united framing a more extensive and uniform bearing on the soil, than the individual parts would have; all other railways having to depend on the uniformity of soil, or artificial road-bed, for their evenness of surface. Whereas my railway track, herein before described, is independent in its formation of the soil on which it rests.

"2. The method of uniting or scarfing the string-pieces, substantially as represented at A and B, Figs. 1 and 2, &c., and in Figs. 33 and 34, sheet 4th. And whereas said scarf can be used with great advantage to unite the ends of large timbers in foundations, piers, bridges, and other structures, I distinctly claim its application to the general purposes of carpentry.

"3. The method of evenly joining and holding railway bars by means of a *metallic spring pressure*, so as to permit the contractile and expansive motion of the railway bar, whether said spring-pressure operates by means of my malleable iron 'chains' described, or as it may be variously modified and united with cast-iron 'chains,' as herein described. The application of a spring to the rail for the purpose described, being in itself new; and as said spring may be variously applied for producing the intended effect, it is to be distinctly understood that I claim the employment of a spring under the various modifications thereof described; and whenever it operates upon the principle and produces the effect in the manner set forth.

"4. The method of holding the iron rails at the middle of their lengths, as set forth and represented in Figs. 17, 18, and 19; also, in Figs. 29, 30, and 32, and in 33, 34, and 35; by which the iron rail is made to support the scarf of the string-pieces, or to form a part of the splice, as herein before described."

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No. 5.

NEW-YORK, JUNE, 1840.

VOL. I.

NEW METHOD OF HYDROGRAPHIC SURVEYING.

BY H. A. NORRIS.

Description.—Two observers, A and B, are placed at points properly selected in a harbor to be surveyed. Each observer has a theodolite, (or instrument for measuring horizontal angles,) a chronometer, flag-staff, set of signal-flags, and a man to make signals, or watch for them with a spy-glass, as may be required.



The sounding-boat C, is furnished with a chronometer, a flag-staff, set of signal-flags, sounding-lead, and is manned with a proper crew, and commanded by the chief of the party or an assistant.

We will suppose it desirable to take observations and soundings every minute. One of the stations, A for example, is selected to make the signals by *its* chronometer, and *the other chronometers* are compared with it. Ten seconds before the commencement of a minute, A's man raises a red flag, calling out, "up." "Up," repeats B's man, who is watching for the signal with spy-glass in hand. Both A and B, having thus a simultaneous warning, direct the telescopes of their instruments

upon the boat's flag, and by means of the tangent screws, follow the boat's motion until A's flag falls at the exact commencement of the minute, his man calling out "down," as does B's man, who is watching for the fall of the flag; at the same moment the sounding is made in the boat C by the chronometer. From the moment their men call out "down," A and B cease to move their instruments, each reads the angle of his instrument, and writes it down opposite the hour and minute. C, in the boat, writes down the depth of water opposite the hour and minute. Their notes are as follows.

<i>A's Notes.</i>			<i>B's Notes.</i>			<i>C's Notes.</i>		
Hour.	Min.	Angle.	Hour.	Min.	Angle.	Hour.	Min.	Depth.
VIII	5	221° 02'	VIII	5	310° 30'	VIII	5	19½ ft 19
	6	220 45		6	310 01		6	18 18½
	7	219 56		7	309 32		7	19 21
	8	219 09		8	308 56		8	20½ 21
	9	218 41		9	308 07		9	21¼ 21
	10	217 36		10	307 14		10	21 20½
	11	216 49		11	306 23		11	20¾ 20
	12	216 02		12	304 58		12	19

The same process is repeated every minute. The boat proceeds over the locality to be surveyed, the soundings are regularly made, and the angles as regularly measured by the instruments on shore. It is always desirable, when it can be done, to sound also at the half-minute between the observations, and *these* soundings may be written between the minute ones, and a little to the right hand, as in C's notes.

Recapitulation.—This method is simply one of triangulation; the observations being taken from the extremities of a base line to a moving flag, simultaneously and at equal intervals of time: one chronometer governing both observations on shore, and another, set to the first, governing the soundings in the boat.

Comparison.—There is a method, described in treatises upon surveying, where two observers measure angles to the flag of the sounding-boat; but the boat is anchored for the time, and the angles are taken by *signal from the boat*; and the signal must be recorded, in order to identify the angles with the soundings to which they belong. To this method there are several very serious objections:—1st. The boat cannot be anchored, the signal made, and the boat put in motion again in

less than from 10 to 15 minutes.—2d. There is great difficulty in clearly distinguishing signals composed of *different* flags, at distances frequently occurring.—3d. Where the signal consists in merely hoisting the *same* flag when the angles are to be taken, the missing of a single signal may confuse and render worthless the whole work of the day ; for in that case nothing can identify the angles with their soundings ; and the intervention of a vessel, an island, or other object, may produce this result.—4th. It is frequently impossible for those in the boat, to judge whether their signal is visible or not from one or both of the stations on shore.

But in the new method, the signal to take the angles is made at one station on shore, and is always visible at the other, for there is no variation in the distance or direction. Each observer having a chronometer, the *time* when any angle is taken, distinguishes that angle from all others, beyond the possibility of a mistake. And when by any cause, an angle or several are missed, those only are lost ; every one taken before or after is identified by the minute when taken.

It often happens that the boat's flag-staff, which may be from 20 to 30 feet high, can be seen by the observers when the boat itself is hid by bushes or other intervening objects. The old methods could not be used here ; for those in the boat, not being able to see the stations, cannot judge whether their own signals will be *distinguished* or even seen by the observers. I have been in the boat, unable for hours to see either station ; but I proceeded as usual, sounding at the regular intervals ; and have had the satisfaction, on returning to the stations, to find the work perfect.

Selection of Stations.—This part of the surveyor's duty requires great care ; and, if well performed, contributes largely to the facility and accuracy of a survey. The stations should be from one to two miles distant from each other ; or if the nature of the ground does not allow you to choose these distances, they may be as near as half a mile, or as far as four miles from each other. This last distance is about as far as ordinary signal-flags can be distinctly seen. Indeed it is too great, unless necessity imposes it. For, if stations are so far apart, the boat must fre-

quently be at a still greater distance from one or the other of them; and then any thickness in the atmosphere may render the boat invisible to the observers, and of course stop the work.

To survey any particular portions of a harbor, the stations should be chosen so that the lines drawn from them should intersect at the boat, under an angle of 90° , or as near as may be to it. In the figure annexed, the points A and B, or any two others diametrically opposite upon



the dotted circumference, would serve as stations to survey the bar C, and much of the ground inside the harbor, giving angles at the boat near 90° . A smaller angle, 60° or even 30° may be used; but the nearer the angles approach 90° , the easier and more exactly the work can be put upon paper; and any errors that may arise from not taking the angles simultaneously, will be thereby rendered insignificant.

When, in the progress of a survey, the stations cease to give angles sufficiently large at the boat, one or both of them must be changed. All the points used as stations, must, of course, be accurately marked, and triangulated in the usual manner.

Service of the Stations.—Each observer should have, in addition to what was enumerated at the commencement, a two-oared boat, to carry him to and from his station; a tent or awning, to shelter his instruments from the sun and wind; and a small directing-flag to be placed behind his instrument in exact line with the other station. This flag is to enable the *other observer* to set his instrument accurately on the line at the commencement of a day's work, and to rectify it, if during the work, it becomes deranged. On arriving at his station to commence work, the observer plumbs and levels his instrument over the point selected, plants his directing-flag in exact line, and directs the telescope of the instrument upon the directing-flag of the other station. Having raised his tent or awning, and made all necessary preparation, he makes signal that he is ready to commence. When the other observer answers it, it is hauled down, as is the answering signal at the other station immediately afterwards.

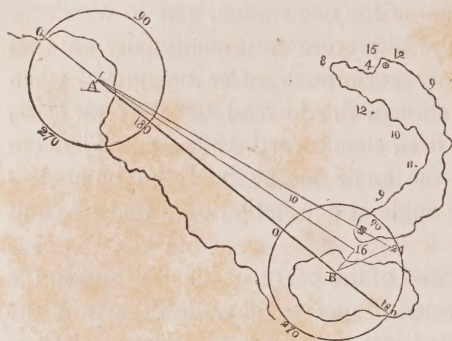
The *minute*-signal will be made the next even 5 minutes by the chronometer, after which the work will regularly proceed. The most careful and prompt among the men must be selected to make the minute-signals at the one station, and to watch for them at the other; and the observers must continually see that those duties are accurately performed. *One* instrument, when directed upon the other station, should read $00^{\circ} 00'$; *the other*, when directed upon the first, should read $180^{\circ} 00'$. The convenience of this is, that the angle at the boat may be always found by subtracting the angle at one station from that taken at the other.

Keeping Notes.—The chief of the party, or his assistant in the boat, has his note-book ruled to receive the angles taken by the observers, which are copied into it every evening when circumstances will permit. The following is a specimen of the complete notes.

LEFT-HAND PAGE.					RIGHT-HAND PAGE.	
Obs'ns at A.		Obs'ns at B.	Time.	Depth.	Y	
136° 30'		66° 56'	7 15	12 ft.		10
135 39		61 05	7 14	15		12
138 42		60 12	7 13	4		10
136 29		48 49	7 12	8		10
146 50		59 54	7 11	12		15
150 35		74 19	7 10	10		15
155 30		87 20	7 9	11		25
161 55		82 03	7 8	9		18
169 56		58 40	7 7	10		25
174 55		98 20	7 6	16	}	20
170 01		118 15	7 5	21		10 ft.
					X	
Monday, April 22, 1838.					TOPOGRAPHICAL NOTES.	

It is convenient, when shores are to be surveyed as well as the bottom, to commence the notes at the bottom of the page, as is practised in compass-surveying. In the specimen annexed, the line X Y represents the course of the boat, whether that course is crooked or straight; and the figures on the right and left of X Y express the distances from the boat to the right and left hand shores, at the respective times recorded in the column marked *Time*. Those distances can be estimated accurately enough by the eye, when they are not greater than a boat's

length or two. To delineate a shore with great exactness, it may be well to check the boat's motion in whole or in part, at the moment of observation, and for a few seconds before.



Plotting.—Annexed is an example of plotting, from the notes above. The points A and B being determined by triangulation, two circular protractors are laid down upon them, so that their readings may correspond with

those of the theodolites at the stations. The angles are then laid off in pairs, and the positions of the boat found by the intersection of lines, as indicated in the figure. Having ascertained points near the shores, the latter can readily be drawn by measuring off the corresponding distances found in the topographical notes.

Currents.—These may be ascertained with great accuracy, by taking observations from two stations to a floating body, so constructed as to take hold upon the upper or under current, as the one or the other is to be examined. If, in addition to the horizontal angles, those of elevation were measured, the same process would ascertain the path of bodies moving in the atmosphere, such as balloons or meteors.

Mountainous or uneven ground can be surveyed with great rapidity, by the means just mentioned. The horizontal angles to a flag *carried* over the ground would give points in horizontal projection, and the angles of elevation or depression would determine every rise or fall of the ground. With good instruments, the work would be done very accurately.

Of using more than two Theodolites.—For the purpose of simplicity in explanation, I have supposed only two instruments to be used. Three or four might with great advantage be used in the same manner: in that case, if one base line did not give proper angles at the boat, another would; and if one observer

should miss one or more angles, there would still remain *data* enough to establish every point. The principles governing the choice of stations may readily be applied to the case where there are three or more of them.

Capabilities of this method.—It must be obvious to those who have carefully read what precedes, that any locality can be surveyed *as rapidly as a boat can be rowed over it*. No buoys are required, nor is any previous preparation necessary. In the survey of the débouches of the Mississippi in 1838, I have frequently anchored my vessel in a new locality in the forenoon, and before night surveyed more than a square mile of the vicinity; leaving, however, the triangulation of the points used as stations to be done afterwards. Any given quantity of ground can be surveyed by this method, in from one-fourth to one-fifteenth of the time necessary to do it by the usual methods. Vessels of war visiting unknown harbors might make valuable surveys in less time than is usually spent in procuring wood and water.

Accuracy of this method.—It has been frequently put to tests that appeared conclusive to all who saw the results, among whom were several scientific officers of the U. S. army. For example: by placing stakes in different parts of a harbor, and visiting them at different periods of the survey, always making a memorandum of each visit opposite the time when made, and then comparing the angles measured by the observers at those different times; or rowing a boat through a creek only wide enough to allow the boat to pass, and repeating the operation in the same creek, the boat proceeding with different velocities, and with the current, against it, &c. and then examining if the drawings made from these several surveys were alike; or by tracing the same island or shore, at different times, by rowing the boat along its margin, and comparing the drawings as before.

This mode of hydrographic surveying was explained by the inventor to a company of scientific gentlemen, at the Mechanics' Institute, City Hall, a few evenings since, and met with unqualified praise for its accuracy and rapidity.

ED.

For the American Repository.

GEOLOGY OF THE STATE OF NEW-YORK.

Report of the New-York State Geological Survey for 1839. Assembly Document No. 50. pp. 484. Jan. 1840.

The geological survey of the Empire State, the offspring of the most enlightened policy and liberal views, rapidly approaches its consummation, on the 1st of July next. The present report is characterized by the same zeal, energy, and signal ability, which have distinguished those of former years; and the most unscientific cannot read it, without being satisfied of the wisdom of that policy which directed this magnificent undertaking.

1. The first report is that of Dr. J. E. De Kay, of the Zoölogical Department. The first part consists of a catalogue of the animals belonging to the state of New-York, as far as they have been figured and described. These consist of—

<i>Mammalia</i> , 13 Genera,	<i>Mollusca</i> , 35 Genera,
12 Species.	30 Species.
<i>Birds</i> , 155 Genera,	<i>Annulosa</i> , 4 Genera.
144 Species.	<i>Crustacea</i> , 6 Genera,
<i>Reptiles</i> , 8 Genera,	4 Species.
17 Species.	<i>Insects</i> , 60 Genera,
<i>Fishes</i> , 58 Genera,	111 Species.
37 Species.	<i>Zoöphytes</i> , 4 Genera.

Of the *Mammalia*, the first order, *Quadrumanæ*, is entirely wanting in the United States: and of the *Carnivora*, although there exist more than 150 species in various parts of the globe, 6 only have as yet been described as residents of this state. Of the order *Marsupiatæ*, 50 species are known, chiefly residents of New Holland: of these, but one, *Didelphis Virginiana*, has been noticed in the United States. Of the order *Rodentia*, family *Musidæ*, about 21 species have been found in this state; but there doubtless remain many others not yet described. Total species of *Mammalia* in this state, 71.

Of *Birds*, about 490 species have been noticed in all North America; and of these, more than 300 have been observed

already within the limits of this state. We are glad to see that all these are figured.

Of Reptiles, 37 species have been observed within the limits of the state ; * 232 species of Fishes have also been noticed, and 234 of molluscous animals. Of the order Articulata, including the Annelides, Crustacea, Arachnides, and Insecta, 68 species have been found ; and of Radiary animals, 16 species.

It will be seen that Dr. De Kay has undertaken a most arduous work : we trust that no short-sighted policy will restrict him within less limits than are required for properly accomplishing his herculean labors. This department of the survey could not be in better hands.

2. The next report is that of Dr. L. C. Beck, of the Mineralogical Department. In his first report, for the year 1836, Dr. B. gave an account of the most important mines of iron, lead, and other metallic minerals within the state. In the report for 1837, he described our most important mineral springs, and gave an elaborate analysis of their waters. In the year 1838, he examined and analyzed many of our other mineral productions, and made very extensive collections for the state cabinet, which are embraced in the report for that year. The last year has been devoted chiefly to the same object ; during which time, in connection with Dr. Horton, he has obtained upwards of 3000 specimens for the use of the state. For a detailed account of Dr. Beck's valuable labors, we must refer our readers to his report.

3. We next have the report of Dr. John Torrey, on the Botanical Department of the survey. Dr. T. estimates the whole number of species of plants, indigenous and naturalized in the state, including the lower orders of the Cryptogamia, to exceed 2400. The Phenogamous or flowering plants, however, have chiefly occupied his attention ; and of these, 1350 have been found within the limits of the state ; and of ferns and plants allied to them, 53 species. The Mosses have not received

* The late Dr. S. L. Mitchill describes but 147 species and 19 varieties of New-York fishes, making 166 in all. Of these, 60 were figured in the 1st volume of the Transactions of the Literary and Philosophical Society of New-York.

much attention, although many specimens of them have been preserved, and the number of them belonging to the state is estimated at 150. Of Hepaticæ and Characææ we, have 30 species. The Lichens are more than 150; and the number of Fungi in the state is at least 300. Of the flowering plants already discovered in the state, 277 are trees or shrubs, 150 are reported to possess medicinal properties, and 140 are plants which have been introduced from foreign countries, and are now naturalized in our soil. Of proper Grasses, our Flora contains 116 species, 24 of which are of foreign origin. In the nearly allied tribe of the Sedges there are 140 species, more than half of which belong to the genus *Larex*.

Dr. Torrey presents us with a catalogue of all the flowering plants and ferns hitherto detected in the state, arranged according to the natural method. Only such synonyms are added as are necessary for distinguishing the species with certainty. The locality, general or special, of each plant is likewise given, together with the time of flowering, popular names, and occasionally some remarks. We are happy to learn that Dr. T. proposes to give us, in his final report, full descriptions of all these plants, in as popular language as the subject will admit of, with particular attention to their economical and medicinal uses. Dr. T. urgently requests botanists in different parts of the state, to furnish him local catalogues of plants, with their time of flowering, and time when the seed ripens; also, the names of such species as are not included in his catalogue, and dried specimens, or drawings with numbers annexed, for examination. Specimens and descriptions of medicinal plants are particularly desired, with an account of their virtues and popular use. Also, information respecting the various kinds of timber trees; the quantity, quality and uses of each species; notices of weeds and other injurious plants, with the best modes of eradicating them; and, indeed, any interesting facts relating to the economical or scientific botany of the state, will be thankfully received. We are gratified to find that Dr. Torrey drops his exclamation points after the names of authorities; an affectation which ought to be expunged from his other botanical works.

4. The next report in order is that of T. A. Conrad, on the Palæontological Department. There is a peculiar interest connected with the subject of organic fossil remains, and we should have been pleased to find the report on this department assuming a *popular* as well as scientific cast, for we see no incompatibility in blending them together. Hitherto some fault has been found with Mr. Conrad, for the exclusively technical character of his reports: we trust that his final report will not be obnoxious to such criticism. We are aware that Mr. C.'s department is a difficult one, and one but little explored hitherto; much indulgence should, therefore, be extended to him; still, he should not forget that he is laboring for the *people*, for whose gratification and instruction it is his duty to aim. We object not to technical descriptions of shells and other organic remains; this is necessary; but a Buckland and a Mantell have shown that an interest and a fascination may be thrown over these subjects, equal, if not superior, to what we experience in the perusal of a novel or book of travels. We have a high opinion of the qualifications of Mr. Conrad for the department assigned him; and we have no doubt he will eventually present such a work as will be entirely satisfactory both to the general and scientific reader. We shall reserve our remarks on Mr. C.'s views to a future number of this journal.

5. The next report in order of publication is that of W. W. Mather, containing an account of the economical geology of Sullivan, Ulster, Delaware, Greene, and Schoharie counties. He describes the discovery of fine building-stones and marbles, favorably situated for exploration and transportation; also, of extensive strata of flagging stones, which were supposed to be confined to a comparatively small area; and of immense deposits of water limestone and peat; the discovery of mineral springs, and the examination of supposed mines, the proprietors of which have been induced to suspend operations, there not being sufficient indications of mineral wealth to warrant further exploration. In this way alone, we believe that an amount of money ten times exceeding that of the cost of the annual survey, will be saved to the citizens of this state, for a long series of years to come. The accomplishing of this object alone, should be a

sufficient inducement for every state to enter upon similar surveys.

The first subject treated of in the report, is that of *Peat*. The four counties assigned to his survey are computed to contain about 2,500,000 cords. It is now ascertained that peat furnishes one of the most valuable manures; and Mr. Mather recommends, as the best mode of preparing it, to make it into compost heaps, with some lime and stable manure, or to have cattle and hogs yarded on it, where it is exposed to the weather and frost. It has been proved—1. That peat is equal in value to oak wood, bulk for bulk.—2. That peat-lands are far more productive than up-lands.—3. That peat manure is more valuable than stable manure.

Mr. M. states that a *coal mine* has been opened in Sullivan county, in the vicinity of Red Bridge, near the Delaware and Hudson Canal, consisting of a bed of black carbonaceous shale, some five feet thick, containing vegetable impressions similar to those of Carbondale. A seam of anthracite, from 6 to 9 inches thick, is said to occur in the shale, which was not seen, however, as the mine was filled with water. Mr. M. thinks there are no seams of workable coal in this region; and yet, that if there should any be found in the state, it will probably be in this vicinity.

The stone so extensively employed for flagging in our cities, is a blueish gray, slaty sandstone, which forms a stratum about two feet in thickness, and can be split out in slabs of from ten to a hundred square feet, and from one to four inches thick. The rock is traversed by joints that divide the slabs about perpendicular to their layers, and as smooth as if cut by a saw. This stratum of flagstone is about 1000 feet *above* the Helderbergh limestone series. The aggregate amount quarried in Sullivan, Ulster, Greene, and Albany counties, is computed to amount to 3,500,000 feet per annum.

Hydraulic cement has become a very important article in the commerce of our state. The beds of limestone that yield this article, are extensively worked in the vicinity of Kingston, Rosendale, Lawrenceville, and High Falls. More than sixty kilns are in constant operation for the manufacture of cement,

each yielding about forty barrels per day, and the total quantity exceeds 600,000 barrels annually. The Croton Water Works, and the various government works, consume large quantities of this cement; and its uses for various hydraulic works and for cisterns, tight cellars, aqueducts, &c. cause a continually increasing consumption. It is also shipped to all the Atlantic ports, and to the West Indies. The kilns are built something in the form of a high furnace, except the hearth, which has a sloping sole of 40° to 45° from the back of the kiln to the floor of the drawing arch at the base. These kilns are kept in constant operation several months, and are charged like a high furnace. The dust anthracite and broken cement, each are charged, as usual in perpetual kilns, twice in 24 hours, each charge being introduced in successive layers at the top of the kiln, after a quantity of cement has been hauled out from the sole of the kiln into the shed next the drawing arch. About a ton of dust anthracite is used daily in a kiln that burns forty barrels per diem. The kilns are usually built double or triple; that is, two, or three, or even more, are built in one stack; one set of men being sufficient to attend several kilns. Some have roofs over them, others have not, but all have sheds over the drawing arches, in consequence of the necessity of protecting the cement from the weather. These kilns, together with the mills for grinding the cement, are situated directly on the banks of the Delaware and Hudson Canal. The cement business of Ulster county alone, gives employment to nearly 1000 men, including quarrymen, burners, teamsters, millers, packers, coopers, and those engaged in transporting the article to New-York; and indirectly it gives employment and profit to many others.

In relation to selecting proper materials for erecting durable edifices, Mr. Mather very justly remarks:—"It is surprising to see how little attention is paid to the selection of materials for construction. Judging from what has come under my observation, the general impression must be, that *any solid stone may with equal propriety be put into the walls of buildings*. It is not so; and in our public works and expensive buildings, it is of great importance to select materials that will stand time unchanged.

Some granites, limestones, sandstones, marbles, and other rocks, will stand the vicissitudes of the seasons for ages, without any perceptible change ; others, nearly similar in appearance, and belonging to the same kinds of rocks, will crumble to sand or powder in a few years. An experienced eye is necessary to judge whether particular kinds of rock ought to be employed for structures that are intended to be permanent."

The best commentary we can offer on these remarks is the fact that the trustees of Trinity Church, of this city, have selected for the erection of their new church-edifice, the soft, friable sandstone of New Jersey, which in all probability will crumble to powder in less than one hundred years ; and this, too, notwithstanding the inexhaustible beds of granite upon Staten Island, which, we understand, have been gratuitously offered for the working. A frailer material than this sandstone can hardly be found any where ; and the only reason offered for its selection is, that its sombre hue is well adapted for the solemnity of such a structure. If this be a good reason, we would suggest as an improvement, that the church be painted black. We would respectfully ask the trustees of this wealthy corporation, if it be not indeed too late, to call for the advice of our state geologists before they proceed any farther ; for geologists *at a distance* know but little as to the real nature of the rock in question.

Mr. Mather, in describing the Shawangunk grit, a rock which lines the borders of the Delaware and Hudson Canal, remarks : " These fine grits would make a beautiful and durable building material, which is as easily dressed as the common granites. Localities were seen within less than two miles of the canal, where blocks could be procured 3 to 5 feet thick, and 5 to 20 feet in their other dimensions, without a seam, and on which the weather has produced no perceptible effect during the ages through which they have been exposed. Such as this the engineer may use, without fear of hazarding his reputation ; and his employer may feel certain that the structures built of it will not crumble down by the ordinary action of the weather in a few years, like some of our public works and private dwellings." The color of this rock is generally white, or of a light gray,

although some beds of it are red. It is somewhat employed for millstones, and for making glass. Its durability ought to bring it into extensive use as a building material.

The remaining Reports are those of Dr. Emmons, Messrs. Hall, Vanuxem, and their assistants. As these contain much interesting and important matter, we shall reserve our notice of them till the next number of this journal. L.

MECHANICS' VADE MECUM.

No. I.

Under this title, we intend to give our readers a series of papers, which will prove useful to every class of artisans: one or more tables will be given with each number, intended to assist the mechanic in making estimates of strength, cost, &c. of materials.

We will briefly state our reasons for the proposed series. It is not unusual (in this city, at any rate) to build ware-houses so heavily timbered, that nearly the entire strength of the walls is required to support the weight of wood-work, or (which is equally fallacious) the walls are sometimes so heavy that a large portion of the material is unnecessary, and walls of a less thickness would support all the weight the floors are capable of receiving: in either case, there is a useless weight of material, which can easily be avoided by reference to well arranged tables of strength of materials. Such tables will greatly assist the builder in making estimates of cost.

To the machinist they will be of still greater consequence. Suppose a case—and such cases are almost as numerous as steam-boats:—An engine is ordered for an Atlantic steamer, of a given number of horse power. The builder is supposed to know the precise weight and strength proper for each part; and therefore, so long as the requisite strength and power result, no further questions are asked, but all is taken for granted as correct: this might and has occurred in engines, where the crank or some other part has weighed five tons more than at all necessary for useful purposes; and as the freight of five tons across the Atlantic, at £5 per ton, would be \$111, and as

fourteen trips are made per year, a loss of \$1554 is made each year to the owners. Suppose such a vessel to remain in use twenty years, the total loss from such a miscalculation would be \$31,080; in addition to extra fuel necessary to overcome the friction occasioned by this excess of metal. Where engines are built by contract, the useless consumption of material causes the contract to prove unprofitable, in addition to the abuse of confidence. (See our last number, p. 241, headed "Machine Drawing and its Advantages.")

Tables of Weight, &c. of Building Materials.

NAMES OF BODIES.	Weight of a cubic foot in pounds and ounces.	Spec. gravity compared with water at 1000	NAMES OF BODIES.	Weight of a cubic foot in pounds and ounces.	Specific gravity compared with water as 1000.
<i>Woods.</i>					
Poplar	23 15	.383	Logwood	57 1	.913
Elm	34 12	.556	Oak (English)....	60 10	.970
Mahogany, (Hond.)	35 0	.560	Ebony	83 3	1.331
Pitch Pine.....	35 0	.560	Lignum Vitæ	83 5	1.333
Willow.....	36 9	.585	<i>Stones and Earths.</i>		
Cedar	37 4	.596	Brick	125 0	2.000
Pear Tree.....	41 5	.661	Paving Stone	151 0	2.416
Walnut	41 15	.671	Common Stone...	157 8	2.520
Forest Fir.....	43 6	.694	Red Granite.....	165 14	2.654
Elder.....	43 7	.695	Free Stone	166 8	2.664
Beech.....	43 8	.696	Slate	167 0	2.672
Cherry Tree	44 11	.715	Grey Granite	170 8	2.728
Teak.....	46 9	.745	Marble	171 6	2.742
Maple	46 14	.750	Basalt	179 0	2.864
Apple Tree.....	49 9	.793	Limestone	198 11	3.179
Alder.....	50 0	.800	<i>Metals.</i>		
Mahogany (Spanish)	53 4	.852	Cast Iron.....	450 7	7.207
Oak (American) ...	54 8	.872	Bar "	486 12	7.788
Boxwood (French)	57 0	.912	Cast Copper	549 4	8.788
			Cast Lead	709 8	11.352

Weight of Lead per superficial foot, for the several thicknesses from $\frac{1}{16}$ th of an inch to 1 inch.

Thickness inches.	Weight lbs.	Thickness inches.	Weight lbs.	Thickness inches.	Weight lbs.	Thickness inches	Weight lbs.
$\frac{1}{16}$	$3\frac{3}{4}$	$\frac{1}{8}$	$7\frac{1}{2}$	$\frac{1}{4}$	$14\frac{3}{4}$	$\frac{3}{4}$	$44\frac{1}{4}$
$\frac{1}{12}$	5	$\frac{1}{6}$	10	$\frac{1}{3}$	$19\frac{3}{4}$	1	59
$\frac{1}{10}$	6	$\frac{1}{5}$	12	$\frac{1}{2}$	$29\frac{1}{2}$		

Cast sheet-lead, 7 lbs. weight to the square foot, is used for roofs, gutters, terraces, or flats. Milled lead, under 7 lbs. weight, is used for ridges, flashings, &c.

For the American Repertory.

THE ART OF BUILDING.

BY JAMES FROST.

 No. V.

Having in former papers shown, that by the aid of modern science, durable, incombustible and temperate buildings, may be as easily constructed as the present perishable, combustible and intemperate; that as much or more space is attainable therein, and by the use of as little material and at as little cost, if a fair allowance be made, as it justly ought, for the saving effected in insurance alone; and as such buildings are in so many respects vastly preferable to the present, it follows they are also much the cheapest.

In estimating the real value of these improvements, we ought also to make a fair allowance for the great public benefit and value these buildings may occasionally be of to the owners, occupiers, and insurers of the combustible buildings in their immediate neighborhood; from the certain and effectual barrier they will ever interpose to the spread of fire, and for which purpose they are so frequently and intensely needed; and on which calamitous occasions the present miscalled "fire-proofs" are found not only ineffectual in protecting their neighbors from destruction, but are frequently involved in the common ruin. In fact, at the great fire in New-York, a host of such *fire-proofs* were destroyed, with just as much rapidity as the other buildings less pompously named; and since then, it is well known that several "doubly improved fire-proofs" have been penetrated and consumed by fires originating in other buildings.

Another powerful inducement, then, for these improvements, is added to the numerous ones already presented to the prudent man, in the costless and patriotic opportunity afforded of being thus alike beneficial to his neighbor and to his country in the time of need, only by having secured his own property from destruction at the cheapest possible rate.

Minor inducements of no trifling value will also be obtained, in the perfect security from vermin, and from the teasing and

nauseous annoyance of noxious insects, frequently as securely as formidably intrenched in wooden buildings.

Another, and by no means a minor inducement, will be found in the great saving of expense for fuel surely accompanying a temperate construction of buildings, in which the ingress of external cold and the egress of internal heat being nearly prevented, the use of stoves will be no longer needed, as essential to comfort. Hence, an invaluable inducement is held out, in the removal of those cruel enemies to blooming complexions and foes to robust health, and the insidious, fell destroyers of life itself.

As enough has been stated to show that incombustible buildings, of every kind, are now rendered of easy attainment, as the great difficulties hitherto attending such are overcome, and the enormous expenses hitherto attending them is now so reduced as to have brought them within the means of all classes of builders; these improvements, involving matters of such vast importance, will doubtless in time receive full attention. What present attention these or any other very important improvements in art will receive, is not very pleasing to anticipate by comparison with the attention that improvements of the greatest consequence have hitherto usually received on their first promulgation. To name Oliver Evans, or Fulton, would be to recall neglect or insult, or both, as the probable first return to be expected in such cases.

Many of the public works of New-York are at present in a state capable of immense improvement. Whoever has seen the remains of ancient buildings in England, and is possessed of the requisite information for comparing their structure with those of modern date, cannot fail to have been surprised at the singular economy of the ancient works, when thus duly compared with those by modern artists.

In various parts, abounding with the remains of public buildings of magnitude, where wharves, bridges, churches, palaces, castles and fortifications, are formed almost wholly of small, round, flint pebbles, smaller than the pebble paving in New-York, without any large stone interbonded, except at the external angles of walls; and these extensive works being mostly situ-

ated on the upper chalk formation, the lime there produced is considered the weakest of any now manufactured. Yet many of these buildings, from five to nineteen centuries old, promise to endure for ages; for of their great strength, experimental proof enough is afforded in the removal of small portions for modern improvements, to effect which, gunpowder is often found to be the only effectual agent.

As the ancients could thus compose such stupendous works with mere pebbles and weak lime, setting slowly and indurating only in centuries, what works may and ought not the moderns to execute, furnished as they are with stone of all sizes, with such an abundance of cheap yet invaluable cements, (wholly unknown to the ancients) of such excellent and various qualities as to be adapted to every situation and object; from those slowly setting in weeks or days, to those setting in hours or minutes—from those hardening only in years or months, to those hardening as much as ever needed in buildings within a few hours or even minutes; and all these effects being as cheaply and readily produced in air, within thick walls or under water? Modern artists, who can thus be furnished with such ample powers, till lately unexpected, (and still inconceivable to many) and supplied as they now are, at will, with iron of every form, quality, and quantity—with steam-engines of any power;—surely then, instead of merely rivaling the ancients in economy, (who had no knowledge of these advantages) they ought on all occasions to excel them immeasurably.

Yet if we credit Alderman Clark's description of the piers and wharves of New-York, as periodically decaying every sixteen years, what a pitiful figure do the modern artists assume! for with the same stone, and with a few other materials abundantly found—and what is more singular, at about the same expense per cubic yard—these structures might be made capable of almost endless duration.

These piers and wharves are at present miserably formed of loose stones placed within frames of rough logs, which the worms and elements are sure soon to destroy; and the only improvement hitherto attempted, consists of an additional external timber-casing, which merely gives an improved

appearance at additional cost, without any corresponding increase of durability, being equally expensive with those so superior as to be unworthy of being put in comparison.

The mean dimensions of the piers in use, and their want of proper magnitude, render them totally unfit for the proper and convenient transaction of business thereon; and their general unfitness and incapacity for the support of large warehouses, make them not only unworthy their situation, but a disgrace to the city and to the age: and they are thus the useless and endless cause of incalculable loss to the mercantile community, by preventing the erection of incombustible water-side warehouses, so long demanded and needed, for the ready protection and cheap storage of the immense stock of merchandize, always in a state of transit through New-York; and which is now exposed to injury from all weathers, to pilferers, to rain, snow, or mud—transported at a great expense to distant stores or cellars totally unfit or inadequate for its reception, and at no remote time again transported and exposed to a repetition of the same unnecessary delays, injuries, and heavy expenses.

Now all these heavy losses are useless and abominable taxes on the merchants of New-York, from which they can by no possibility escape while transacting business in this port, but by the erection of proper piers, suitable for and supporting substantial and incombustible warehouses, furnished with labor-saving machinery. They would thus be placed on a level with the merchants of other civilized places, and their property protected from that conflagration to which it is now perpetually exposed.

That such warehouses would be immediately built, is undoubted, because a more safe and ample return for capital may be derived from the outlay, than from any other mode of investment; and therefore, the only possible obstruction to these useful works arises from the wretched construction, dimensions and state of these contemptible piers.

But our wonder will still increase, on further inquiry: the space for piers in New-York being absolutely unlimited, and the necessary materials exhaustless, and not only valueless but an incumbrance to the proprietors of other parts of the island;

and their removal would serve the double purpose of forming substantial and enduring piers in New-York, and of effecting thereby a public improvement much needed in another part of the island, which improvement would thus be of little cost, because it is principally obstructed by the very materials required for the piers.

The proper formation of these piers and wharves in the economical manner referred to, consists in the proper selection, preparation, and use of such hydraulic materials, as being mixed with water, sand, pebbles, and rough stone, will readily set under water within a few hours, and within a few days assume, and forever retain, the consistency of a natural rock, of any required form or dimension. The materials, in small quantities at a time, as mixed, are to be placed within a temporary wooden frame, in regulated quantities, to form a uniform solid mass, of the exact shape and magnitude of the frame provided ; which frame, when the work is raised to low-water mark is removed, and the face of the pier formed with rough ashlar, and filled in with the cemented rubble compound to its intended general level, in which any required aperture may be left for drains, sewers, or cellars, which, with the structure altogether, may thus be formed from the cheapest materials, of uniform fabric, of any required shape, as useful, firm and imperishable as a natural rock.

The level surface thus obtained will constitute a pier of a superior kind, for the more convenient and pleasant transaction of all business than any other, because it will be protected from the weather by a range of incombustible warehouses over head. All goods landed on this pier will be under cover, and with the persons thereon be defended from the inclemencies of the weather, and the landing and re-shipping of goods be accomplished, with that expedition, security, trifling expense, and comfort, as has hitherto been unapproachable. Thus all parties interested or employed thereon will be much benefited, and no one injured ; while the port of New-York, affording the improved facilities for business, which its admirable natural situation is capable of receiving from art, will be as satisfactory and creditable to the corporation as honorable to this free state.

UNITED STATES MINT, PHILADELPHIA.

In our remarks on Prof. Cummings's lecture, (No. 3, p. 200) we indulged in a comment on the applicability of the arts of design to the mechanic arts; since which we have had an opportunity of seeing their application most fully and beautifully developed.

The steam-engine now in use at the Mint was designed by Franklin Peale, Esq. chief coiner; and were this the only testimonial of his taste and genius, it would be sufficient to place him high in the catalogue of American engineers.

The engine room is as clean as a parlor, perfectly noiseless, and free from all the usual hissings, leaks, oily smells, and other nuisances; every part of the engine, not excepting the fly-wheel, is turned and polished; the journals supplied with oil by syphon-cups, which are regulated with such nicety that not a drop of oil is to be seen even on the larger bearings.

This engine is more classically arranged than any we have ever seen. The cylinder, pump, &c. are mounted on an entablature, supported by eight columns of the Grecian Doric order. These columns are so arranged as to contain the pipes for ingress and egress of steam and water, and consequently no steam pipes are visible. The steam is used expansively, and can be cut off at any part of the stroke. The passage from the cut-off valve or chest, is connected with the steam chest, which resembles the other, containing what is termed a long *d* valve or slide, which renders the cylinder and its appurtenances perfectly symmetrical. The supports of the pump are in perfect keeping; its plunger acting in place of guide-rods to the piston. The fly-wheel is 16 feet in diameter; and having been turned off in its present seat, runs so true that the eye can detect no variation. The stop-valve of the engine is in the form of an Etruscan vase, placed on the pedestal between the end columns under the cylinder.

The arrangement of the governor we believe to be original with Mr. Peale, and it does him infinite credit. Its peculiarities are, regulating the number of strokes to be made by the engine per minute by an index, and performing all the usual offices in

addition thereto. We are prevented from giving a full account of the governor, from the fact that it would forestall a very minute description which will be given in Mr. Hodge's work on American steam-engines, which will appear in about a month.

The floor of the engine-room is paved with colored tiles, similar to those described by Belzoni in the antique palaces of Carnac. The boiler-room is equally creditable; and the visitor would scarcely know, unless told of it, that he was near an engine stack. The boilers have dead heads; not a rivet visible. The guage-cocks, connections, &c. without a leak; not a drop of water, nor the least appearance of steam is any where to be seen.

The machinery in the coining department is equally beautiful, and its accelerated movement under Mr. Peale's arrangements must prove a great saving to government.

We cannot close this article without recording our candid opinion, that if the machinery at the Mint had no other use than to incite our mechanics to emulate its accuracy and beauty, it would be sufficient excuse on the part of government for the outlay.

For the American Repertory.

LYCEUM OF NATURAL HISTORY.

PROCEEDINGS.

September. Mr. W. C. Redfield informed the Society that fossil fish had been discovered by Dr. Gale in the New-Jersey sandstone at Boonville, and that they were apparently similar to one of the species found in the sandstone of the Connecticut valley. Dr. Gale presented a remarkable growth of the root of a willow, which, while of a size less than that of a common goose-quill, penetrated a knot-hole of a water-log, and after entering, completely filled the bore of the log with its numerous fibres, cutting off all passage of the water. Dr. G. also laid before the meeting a specimen of a new application of printing, by which both pages of a book are printed simultaneously, by arranging the type or stereotype plate on the surfaces of two cylinders.

Mr. Inman presented specimens of a peculiar species [?] or variety of maize produced from kernels taken from the crop of a wild goose. These ears were of the second year's growth, and retained the same peculiarity of form and arrangement as those laid before the Society last year. Dr. Hornbeck presented several species of butterflies, from the island of St. Thomas, West Indies.

The Transactions of the Literary and Historical Society of Quebec, Vol. III, Part 4th, was received from that Society. Mr. John Fry presented "The Natural History of Animalcules," by A. Pritchard. Dr. Torrey presented the first part of his Flora of North America. Specimens of copper ore from Bogota, South America, were received from Mr. Gooding. Mr. Bell presented some curious impressions in limestone, from the neighborhood of Rochester, N. Y. Referred to Dr. Gale, for examination. Loudon's Mag. of Nat. History, and the London and Edinburgh Philosophical Magazine for August, were laid upon the table.

October. Mr. Redfield submitted to the examination of the Society a work, entitled "An attempt to develop the Law of Storms," by Lieut. Col. Reid, of the Royal Engineers. Capt. L. Sloat presented a number of fossil shells from the tertiary formation of Alabama. The Annals of the Horticultural Society of Paris were received from that Society. Dr. Gale, to whom was referred the impressions in limestone from Rochester, reported that the impressions were probably the result of concretion, formed by a chemical action analogous to that by which clay-balls, septaria, &c. are formed. Dr. G. presented specimens of granite in a state of decomposition, from this island, near 24th street: he also announced that he had recently found serpentine *in situ*, upon the island, between 58th and 63d streets, and 10th avenue and the Hudson, where it is found in a state of close intermixture with limestone. Professor Bache presented a number of pamphlets, one of which contained his observations on the New Brunswick tornado of June 19, 1835. Mr. W. C. Redfield briefly stated the difference between his own views and those of Prof. Bache, relative to the direction of the currents of wind in that and similar tornadoes. Dr.

Torrey laid before the Society specimens of apophyllite and azeolitic mineral, supposed to be mesotype, from the railroad cutting, Bergen, N. J. Also, a paper on the genus *torreya*, from the Annals of Natural History. Mr. W. C. Redfield mentioned that the fossil fish obtained from the sandstone of New Jersey had proved to be identical with the species found in the sandstone of Connecticut; thus proving the formations to be contemporaneous. Dr. Gale stated some interesting facts relative to the diluvial scratches upon the rocks of this island. He had found them coincident in direction with those upon the trap ridges of New Jersey: he observed them from the northern extremity of the island to as far south as 16th street, and upon the highest and the lowest points.

The September number of the Magazine of Natural History, and the London and Edinburgh Philosophical Journal, were laid before the Society. Prof. E. Loomis, Prof. S. St. John, and Prof. John Johnson, were elected corresponding members.

The President exhibited the cone of the male flower of the *zamia horrida*, raised in a green-house at Fishkill. Mr. J. D'Orfeuille presented a specimen of *cerithium tristoma*, from St. George's island, West Indies.

November. Dr. Gale announced the occurrence of talc and actynolite on the island, near 60th street. Dr. Torrey presented, in behalf of himself and Dr. Gray, the second part of his *Flora of North America*: he also read an extract of a letter from Prof. Bailey, of West Point, announcing the discovery, by Dr. Jackson, of vast deposits of fossil infusoria in Maine and Rhode Island. Mr. Halsey presented, in behalf of Mr. E. Doubleday, six volumes of the *Entomological Magazine*, being a complete set as far as published. Dr. Smith stated, that much controversy had arisen upon the question of spontaneous or equivocal generation; and in connection with the subject, he mentioned, that in the pine lands of Virginia, whenever the pines were cut, and the land left uncultivated, they were invariably succeeded by a growth of oak or hickory; and that, although search had frequently been made, he knew of no instance in which an acorn or nut was found to be attached to the root of the young plant. Dr. Gale exhibited a splendid

crystal of garnet, with replaced edges, $4\frac{1}{2}$ inches in diameter, found on the island, near 57th street and 10th avenue. Dr. G. also stated many interesting facts relative to the boulders on the island. He mentioned he had traced to their origin the boulders of red sandstone, sometimes called jasper rocks, so abundant in the diluvium near the upper part of this city, having found the same rock *in place* beneath the trap near Fort Lee, New Jersey. Mr. L. W. Sloat and Edward Doubleday, Esq. were elected corresponding members, and Mr. J. R. Marshall resident member.

December. Mr. De Rham exhibited a thrush, which has hitherto been confounded with the common one, (*turdus solitarius*) and which he thinks constitutes a distinct species: he pointed out the distinctive characters of the new species, and announced his intention of laying a description of it before the Lyceum, at some future period. Mr. Cozzens presented specimens of micaceous iron ore, in a coarse sandstone of a peculiar character, from boulders near Bull's Ferry. The same rock occurs in place at Schuyler's copper-mine, Belleville, N. J. The President exhibited the cone of the *pinus pinea*, a native of the south of Europe, the seeds of which are eaten by the peasantry. The London and Edinburgh Journal of Science, and the Magazine of Natural History for November, were placed before the Society. The Transactions of the Agricultural and Horticultural Society of India, Vols. 4, 5 and 6 were received from that Society.

Dr. Boyd presented the 1st and 2d Reports of the Geological Survey of Virginia; also, a specimen of cats-eye penetrated by asbestos, from the Blue Ridge, Paige county, Virginia. Mr. Benjamin Moore was elected resident member. B.

FRANKLIN INSTITUTE, PHILADELPHIA.

We had an opportunity, a few weeks since, of attending one of the monthly conversational meetings of this society.

The institution is too well known and appreciated to require any comment from us. Its conversational meetings, however,

are peculiarly beneficial, and worthy of imitation by other associations. The members meet for mutual instruction, and each communicates to the others present any new facts connected with the sciences or mechanic arts, which may have transpired since the last meeting: thus each member, in mercantile phraseology, is fully *posted up* to the day; and the opinions and experience of practical men are thus rendered available to all the members. The Mechanics' Institute of this city has organized similar meetings, which are held at the City Hall three evenings in each week. They are indebted for the hint to the Franklin Institute; and had that institution conferred no other benefit than this upon the mechanics of New-York, it would be entitled to their warmest thanks.

REMARKS ON SPECTACLES

BY DR. WALLACE, OCULIST, N. Y.

There are two periods of life at which vision is apt to be influenced by defective adjusting power. At fifteen, the beard begins to grow, the voice becomes rough, a change takes place in the whole system, and in the pampered and luxurious the erectile tissues are apt to become morbidly excited. As the adjusters of the lens belong to the erectile class of membranes, they also occasionally become over-distended, and draw the lens so far forward that the patient cannot discern distant objects without the aid of concave spectacles. Short-sightedness most frequently occurs about the time of puberty, and is for the most part confined to the over-indulged, while it is seldom seen among the followers of a rural occupation. When spectacles are worn at this period of life, the lens becomes fixed in a wrong position, and the exertions of nature to remedy the defect are prevented. A little of the extracts of stramonium or henbane, rubbed upon the brow at bed-time, and washed off in the morning, is a simple and often an effectual cure for short-sightedness.

At forty-five the hair begins to turn grey, the tissues become relaxed, and owing to the want of power of the adjusters to draw forward the lens, it is drawn back by the elasticity of the

membranes behind it, so that the person cannot see near objects distinctly without convex spectacles. At this time, frictions on the brow and temple, with a solution of four grains of strychnine in a gill of alcohol, with a little vinegar, will in many cases make the vision perfect.

Far-sightedness is occasionally observed among the young. In the Edinburgh Medical and Surgical Journal for January last, there is related the case of a boy $9\frac{1}{2}$ years of age, who had been three years at school, and at once became so far-sighted that he could only see near objects distinctly by wearing his father's spectacles; yet he recovered his sight by judicious treatment. It is the opinion of the practitioner, that if the wishes of the patient had been complied with, and he had been allowed to continue the use of his father's spectacles, the *presbyopia* (far-sightedness) would have become a confirmed disease.

The talented editor of the Boston Medical and Surgical Journal makes the following observations:

"It is one of the gross mistakes of approaching age, that people at such times imagine a necessity for spectacles, when, in fact, in eighty cases out of a hundred, the eye-sight is positively injured by them. If we tamper with our eyes, and interpose glasses between the cornea and the object, a remodification and readjustment of the parts within necessarily follow; and when this new arrangement has once been established, it is no easy matter to restore the organs to their former primitive condition. Age brings with it a relaxation of the tension of all the tissues, and the eye suffers temporarily with the entire system, but soon reacts, having within its own constitution a principle of adaptation, according to the circumstances, habits and condition of the individual.

"From forty-five to fifty, a period when glasses are erroneously supposed indispensable, were they not resorted to at all, although there be a defective vision at the former focal distance—in reading, for example—the sight would soon begin to improve, and finally, to all intents and purposes, in a majority of instances would be reestablished. It is a law, and strange it is that its indications are not more observed, that the eye at every period

of life will accommodate itself to the wants and necessities of the individual, provided it is not artificially deranged. Imperfect vision, the evils of near-sightedness, and the misfortune of not seeing distinctly in old age, were never heard of as being universal, till opticians had become numerous. We do not deny the utility of spectacles after they have been once resorted to; but we perfectly agree with Dr. Wallace, in saying that they are rarely necessary. Near-sighted children are often kept in that state through life, by being early furnished with concave spectacles. Withhold them altogether, and the eye would, in exact obedience to the laws of its organization, adapt itself to the labor required. But when the glasses are once put on, they must ever after be retained.

“Incalculable injury has been the result of the fashionable folly of wearing quizzing-glasses. Both gentlemen and ladies, in the spring-tide of youth, whose eyes are without a single defect, peep through these useless appendages of supposed gentility, till a permanent and incurable difficulty ensues that time has no power to correct, which consists in a want of agreement in the focus of the two organs. Unless the surface on which the image impinges on the retina perfectly agrees in both eyes, there will be distorted and indistinct vision—such as this kind of object or prospect glass produces.”

MEDALS, &c. FORMED, BY PRECIPITATING COPPER FROM ITS SOLUTIONS, BY GALVANISM.

In our last number we gave some account of Prof. Jacobi's process, as practised by Mr. Spencer of London; since which, we have seen the operation fully performed, and take great pleasure in giving the details. The apparatus used by Mr. Peale of Philadelphia, is simply a wooden box, with a partition of plaster of paris in the centre, dividing it into two cells, in one of which is placed a solution of sulphate of copper, and in the other dilute sulphuric acid. A cast is made with type-metal of the medal to be copied, to which is attached a copper wire: a piece of zinc is also attached to a copper wire. On the partition or in its vicinity is placed a small cup containing quicksilver;

and after suspending the cast in the solution of sulphate of copper, (its back and edge being previously coated with beeswax, to prevent the copper precipitating on any other part except the face) and the zinc in the dilute sulphuric acid, the ends of both wires are placed in the cup of quicksilver, thus causing the connection to be complete. After remaining a sufficient time, (usually from one to three days) they are removed from the box, and the copper previously in solution is found precipitated in metallic form on the surface of the type-metal, perfectly aggregated and firm, giving a copper medal more precise and sharp than could possibly be formed by any other known means.

James R. Chilton, M. D. has been sometime engaged with experiments on this subject, and from his high reputation as a manipulator we may expect the most important results. Dr. Chilton has found it advisable to amalgamate the zinc before its immersion, which causes greater rapidity and certainty of action; also, to immerse while the solution is hot, and to keep the solution of copper saturated during the entire process, by suspending crystals of sulphate of copper, in a gauze bag, in the solution, which will dissolve as required. The whole process should be performed in a warm place to secure a good copy.

To amalgamate the zinc, it is only necessary to wet its surface with muriatic acid, apply pernitrate of mercury, and immediately immerse it in, or cover it with, fluid mercury.

We are informed that Mr. Joseph Saxton, of Philadelphia, was the first successful experimenter in this country; and from his specimens which we have seen, should conclude that his progress thus far is fully equal to that of the original discoverer.

Mr. Saxton exhibited, at the Franklin Institute, a copy from a pentographic plate, so perfect that it might readily be mistaken for the original: the polish, and even the marks left by the buff, were fully equal to the plate from which it was taken. He has also copied a Daguerreotype plate, which, when placed in a proper light, the mere difference in the quality of surface of the parts (for there can be no indentations) causes the picture to be visible. This could not be copied in any other way, as pressure would destroy so fragile an arrangement.

From these facts it is evident that wood cuts can be stereotyped in copper, if necessary, and be sharpened by the burin, so as to print with great beauty; or if metallic surface is all that is necessary to insure success in making copies by this process, an impression from a copper-plate, on paper, may be bronzed without destroying its sharpness, and the precipitate would give a copper-plate, from which others can be printed; the indentations caused by the raised ink being sufficient to receive ink in the same way as the original plate.

It is well known that other metals can also be precipitated with similar effects, and consequently the artist may model a vase with clay, from the outer surfaces of which a mould may be taken in type-metal, in which silver can be precipitated to any thickness over the whole surface equally, and the space between filled with copper by the same means: thus we have a silver-surfaced urn, highly ornamented, without the expense of chasing; and any number of duplicates may be made from the same mould.

To relieve the precipitate from the mould, it is only necessary to plunge both into boiling water, when the difference in their expansion will separate them. The precipitate may afterwards be annealed, if required, without injury, by placing the back-side of it on iron at a high heat.

Since writing the above, we have received Newton's London Journal, containing an impression of an etching on copper, and also an impression from an electrotpe precipitated on the same plate, proving that a copper-plate may be duplicated any number of times, without injury to it. The impression from the precipitated plate is fully as sharp as that from the original. A precipitation was first made upon the original etching, which gave raised lines; on this a second precipitation was made, from which the impression was printed.

The following is extracted from a letter to Richard Taylor, Esq. by Edward Solly, jr. published in the London and Edinburgh Philosophical Magazine for April, 1840.

When the mould employed is perfectly clean and sharp, and the process has been properly conducted, the copy obtained is of pure and brightly metallic copper, usually of a pink color. If a copy of a medal

thus taken, and after having been removed from the mould, have a small quantity of copper precipitated upon its face, it assumes a most beautiful dead silky lustre, which with very little if any injury to the sharpness of the work, gives it a very beautiful play of light and shade.

The color of the precipitated copper appears to be very much influenced by the nature and condition of the mould; and by paying attention to this circumstance, it may be obtained of a great variety of shades of color. I have sometimes thought that the color of a voltaic cast of a medal is dependent on the nature of the metal of which the original medal is composed; because I frequently observed that copper precipitated in a fusible metal mould, made from a silver medal, had a remarkable whiteness, while those similarly made from copper medals were red, and from gold had a yellow color. On endeavoring to ascertain whether these effects were really dependent on the nature of the original medal, I found that so many little causes seemed to influence the results, that it was almost impossible to draw any certain conclusions with regard to these curious peculiarities of color. The surface of the deposited copper is exceedingly apt to tarnish from exposure to air, frequently becoming partially bright orange, and sometimes even of a brilliant red color. When heated up to nearly a red heat, it acquires a uniform iron-grey color which is perfectly permanent. The precipitated metal is rather brittle, though very elastic; but by heating it, and allowing it to cool slowly, it becomes tough and flexible.

In this process it is evident that a metallic surface is requisite for the commencement of any precipitation of copper: the arrangement, in fact, forms a single cell of a Daniell's battery, and is incomplete without the presence of the surface of the second metal in the sulphate of copper.

Mr. Spencer has shown, however, that moulds for the precipitation of copper may be made of any substance, by gilding them or otherwise covering their surface with a thin film of metal, which affords a conducting surface for the first portions of copper to be precipitated upon. My attention was early directed to this part of the process, because it seemed to open a wide field for new and beautiful applications. I was induced to pay particular attention to the deposition of copper upon non-metallic surfaces, and in consequence made numerous experiments to ascertain the circumstances most favorable to its precipitation under these conditions. My first experiments were made on surfaces of plaster of paris, which I endeavored to coat with copper, so as in fact to convert plaster casts into bronzes. I commenced by gilding the surface with different metals, in the manner proposed by Mr. Spencer; but I found it exceedingly difficult to get a perfectly smooth and uniform surface: the process succeeded best with gold-leaf; but even that had its objections, and was besides very expensive. Subsequently I tried metals, such as bismuth and antimony, in a state of very fine division, ground up with water and glutinous matters: these attempts were, however, not much better than the first trials.

In the course of these experiments I observed a curious fact, which I had not at all anticipated, and which very materially assisted me in attaining the objects which I had in view. When I had endeavored to precipitate lead from a solution of one of its salts, in the same way that

I had been doing with copper, I found that small grey crystals of lead soon formed upon the most prominent parts of the metallic mould I was employing, and which happened to be a leaden cast of a medal: these crystals rapidly increased in size, extending towards the membrane bag containing the zinc, which was about three inches distant from the mould. As soon as the crystals reached the surface of the membrane, they bent about in various directions, crossing and recrossing each other until they had completely enveloped the membrane in a net-work of reduced lead. Again: when silver is precipitated from the fused nitrate, by electricity, the crystals formed at the one electrode extend across the fused electrolyte, until having reached the opposite electrode, they complete the metallic circuit, and prevent further decomposition. In the same way I expected that when copper was deposited against a badly-conducting surface, it would increase much more rapidly in the direction towards the zinc rod, and that it would have but very little tendency to increase sideways; but I found, on the contrary, that the deposited copper had a remarkable property of extending by its edges far more rapidly than it increased in thickness; seeming to creep along or cling to the surface of the plaster or other non-conducting substance, against which it was being precipitated: and even when the plaster surface was placed at an angle of 45° to the zinc rod, and the deposition commenced in the centre, where a piece of gold-leaf had been applied, the copper extended equally all round, and quite as fast on the side, where it receded from the zinc, as on that part where by increasing it approached it. Following out this circumstance, I soon found that by very slightly improving the conducting power of the surface of the plaster or other non-conducting substance, I was enabled to precipitate copper without any gold-leaf or other metallic surface for commencement. The degree of conducting power requisite for this purpose was very slight; all that was necessary being to wash the surface over once or twice with a solution of nitrate of silver or muriate of gold, drying and well blacking each successive coat by exposure to light, the surface having previously been well rubbed over with a small quantity of plumbago. When thus prepared and placed in the solution of sulphate of copper, it was sufficient to touch any part of it with the wire attached to the zinc to cause the precipitation: a small ring of copper soon formed on the blackened surface round the wire, which increasing in size, in time covered the whole surface which had been prepared. When the deposit of copper had reached the edge of the prepared surface, it still continued to increase, but more slowly, extending around the edges, even on to the back of the plaster, and accommodating itself to all the inequalities of its surface almost as perfectly as if it were metallic. In this manner I have caused it to be precipitated along the surface of card-paper, and on a variety of the most delicate and easily destructible organic substances. Indeed I have frequently seen it, when arrested by an air-bubble, gradually surround and envelope it, and thus form a perfect cast; the process going on with sufficient rapidity, and yet without disturbing so frail a form.

Some of these experiments are interesting, when viewed in relation to certain phenomena of fossilization, not merely in cases where organic

matters are replaced by pyrites, but also in those where silica and other earthy substances are concerned.

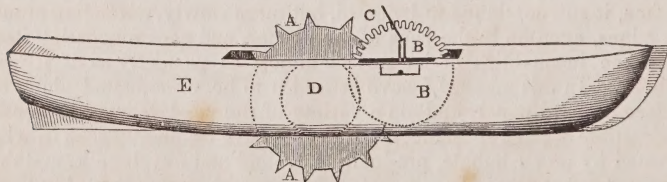
By this process I was easily enabled to cover the surface of any article moulded in plaster, sulphur, wax, or any other substance; but it usually happened that by the time the whole surface was covered, some parts had begun to throw up little mammilated excrescences of copper, which destroyed the smoothness and regular appearance of the surface. Although I thus failed in my original purpose, yet I saw sufficient reason to feel no doubt that plaster may be covered with a uniform coating of copper. The surface of the copper precipitated against the plaster is of course smooth, and therefore the process might be conveniently employed in any case where one or only a few copies are required of any metallic surface. Thus finger-plates for doors, and all kinds of thin, ornamental metal-work, may be copied with great perfection.

A very beautiful effect is produced by coating the surface of fac-similes of medals or casts, made of lead or fusible metal, with a thin film of reduced copper: they then exhibit the beautiful silky, dull appearance which I have before alluded to as being possessed by the precipitated metal. If these could be preserved from tarnishing by the application of any varnish or lacquer, exceedingly beautiful and cheap ornaments might be made in this manner, such as clock cases, &c.

I have likewise been engaged in a series of experiments on the precipitation of other metals by similar means, and shall probably, when sufficiently at leisure, prepare a short account of them.

Note.—The plan proposed by Mr. Solly, in using nitrate of silver for inducing precipitation on the surface of non-metallic bodies, has been anticipated by Dr. Chilton, who prepared paper in this manner, some time since, for the same purpose. Quere: Would not a single metallic point, passed through a plaster cast, and connected on the back-side with the wire, be sufficient to induce precipitation?

Report of the Committee on Arts and Sciences of the Mechanics' Institute, upon JOHN I. WEEKS's Canal Tow-Boat.



Description.—A is a toothed wheel revolving in a moveable frame, (not seen in the drawing) which is suspended by one end to the shaft of the wheel B. The wheel D, indicated by

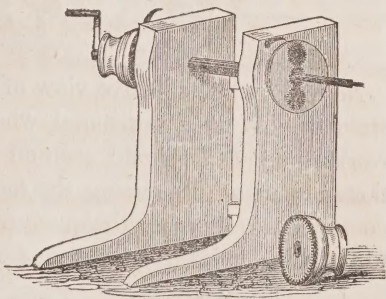
the dotted circle, is permanently attached to A, and has cogs upon its periphery working into the cogs upon B. The *frame*, referred to above, is intended, by its suspensory position, to permit the teeth of A always to rest upon the bottom of the canal—its inclination varying with the depth of water. Motion is communicated to the machinery by an application of steam or other power to the shaft of B, and as will be seen the boat is propelled by the action of A upon the bottom of the canal.

The committee cannot doubt that a boat upon this plan, properly adjusted, will perform the duty required of it. An objection, and the only one made to it, based upon the possibility of injury resulting by its use to the bottom of the canal, the committee does not think valid.

WILLIAM A. COX, *Chairman*.

Report of the Committee on Arts and Sciences of the Mechanics' Institute, upon R. EVERETT'S Improved Ship-Wrench.

This invention is one of much value for river craft, or for lightly manned vessels having large sails, as the strength of one man in warping a vessel or making sail upon her, by this wrench, is nearly equal to that of four men expended upon the com-



mon wrench—with, however, the corresponding loss in speed.

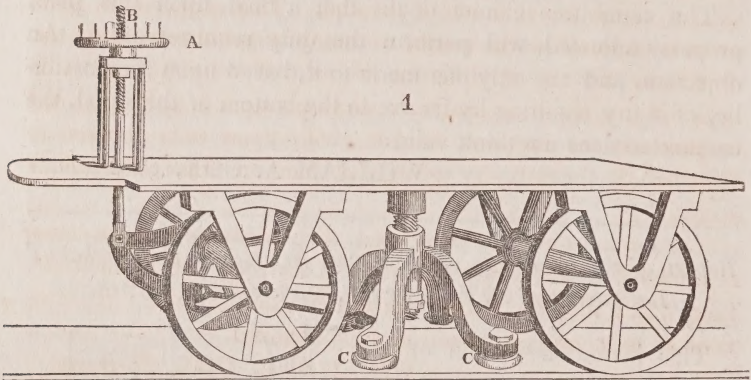
In general appearance, Mr. Everett's wrench resembles those in ordinary use, differing from them only by an internal alteration of the *heads*, a description of one of which will serve to show its action. Upon the axle is a cog-wheel, that works into two others placed upon the frame: these last communicate motion to the head, by working into cogs on the under side of the toothed band that is used to check a backward revolution of the head.

WILLIAM A. COX, *Chairman*.

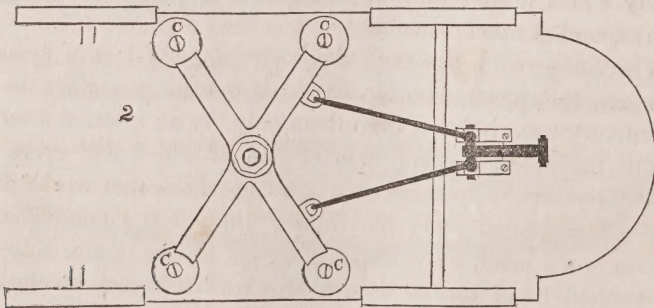
☞ Mr. Noah Silleck, No. 38 Peck slip, is agent for the sale of Everett's Improved Wrench.

Report of the Committee on Arts and Sciences of the Mechanics' Institute, upon MATTHEW W. KING'S Invention for preventing accidents upon Railroads.

The objects of this invention are—1. To insure safety in the descent of cars upon an inclined plane.—2. To check suddenly, if necessary, and at all times with ease and certainty, the progress of a train of cars upon a level railway.—3. To prevent the common casualty of running off the track.



No. 1 is a perspective view of a truck, with the apparatus attached. A is a horizontal wheel, with a nut in its centre, working upon the thread seen on the rod B, and by its revolutions raising or depressing the rod; the motion from which is communicated through the quadrant, shown between the wheels, to the arms or levers placed under the centre of the truck.



No. 2 is a horizontal plan of the apparatus, representing the levers and their connection with the rod B. The action of A,

as stated above, will cause the small wheels C C C C, on the ends of the levers, to touch the rails on both sides, and produce the degree of friction necessary for stopping the train.

This arrangement admits of unlimited strength of materials ; hence in its application to cars, it can in all cases be made equal to the circumstances under which it may be required to act. It has been supposed by some, upon a cursory examination of the machine, that the lateral pressure of the levers would be sufficient to throw the rails out of parallel. This supposition, however, is opposed to the results of many experiments, with the apparatus moving at different degrees of velocity, and it is believed that the comparatively slight pressure which is needed to produce the required friction, will, upon rails secured to their beds in the ordinary substantial manner, cause no injurious strain.

The committee have witnessed with pleasure the operation of a model of Mr. King's invention in the rooms of the Institute, from which they are led to believe that the projector's expectations as to its efficiency will be fully realized.

WILLIAM A. COX, *Chairman.*

NATIONAL ACADEMY OF DESIGN.

Proceedings of the Annual Meeting, held at the Society's Rooms, Clinton Hall, May 13, 1840.

The Council presented their annual report upon the general condition of the Academy, which was read and accepted.

The Treasurer presented his annual report, which was read and accepted, accompanied with the following supplement :

Supplement to the Treasurer's Report of 1840.

GENTLEMEN—By reference to the statement of the accounts herewith furnished, you will find the total receipts of the year from all sources, to be \$5798.28 ; and the total expenses during the same period, \$5798.27. Of the receipts, it will be perceived that they include the amount withdrawn from the invested fund, to wit, \$1300. Interest money receivable, \$313.39 ; rent of the apartments, \$100 ; exhibition of the Vattmare collection, \$140.49 : leaving the balance \$3944.40, being the net receipts of the annual exhibition of 1839, which is \$754.80 less than that received at the exhibition of 1838. It will also be observed that

the expenses exceed those of last year \$627.42. Hence the necessity of applying to the invested fund to meet this contingency, which occurred after the amount marked as "invested" in this year's account had been funded, and as it afterwards proved, was more than could be spared to be carried to that fund. Among the expenditures are included \$101.92, required to repay money advanced by the Treasurer on last year's account, and which of course forms no part of this year's expense; \$2000 carried to the invested fund, an amount equal to that of last year; and the extra expenditures dependent on circumstances, and subject to the decisions of the Council, of \$690.94; and in the same class may be further included the amount of expenses chargeable on the exhibition of the Vattamare collection of drawings, of \$231.82, showing a loss on *that exhibition* over the receipts of the same of \$131.82, (so far as ascertained, exclusive of gas bills, which are inseparable from the general accounts.) The general expenses of the institution amount to \$2773.89, and exceed those of last year of the same class by \$303.03, which have of necessity increased with the progress and enlarged accommodations of the institution; and in this amount is included \$500.44, the expenses of the schools, (at present free of all charge to students.) Of this latter amount, \$305 at least is chargeable to the Life School, by far the more expensive of the two.

While on this subject, the Treasurer would respectfully call the attention of the Academy to *an extension* of the advantages of the Life School, as the limited number attending this season, at no time more than *eight*, has advanced the average cost of each student to \$40; an amount greater, it is believed, than contemplated by the Academy; and as the expenses of this School are in no way increased by an addition of students, it is believed that it may prove of benefit to the student, and no loss to the Academy, to *extend its advantages*. In the event of an increase proving impracticable, either from a want of proper applicants for admission, or from its being deemed injudicious or inexpedient to admit a greater number, it may, with the above facts before you, be a matter for consideration if it is desirable to continue the School, at so great an expense to the Academy. This is submitted, although somewhat out of the province of the Treasurer's department, under the belief that the information cannot readily be gathered from any other source, as the statistical facts are exclusively in this department. The invested fund of the Academy, at present on interest, amounts, exclusive of the late drafts, to \$6000, which has under the direction of the Council been, as is believed, safely and properly invested. Of this latter amount, a portion will be required to enable the Academy to furnish and arrange their rooms in the new building, with all proper fixtures and accommodations for their occupancy by the *institution*.

With these facts before you, gentlemen, I believe you have a concise and full view of the financial affairs of the Academy; and the present flourishing condition of the same must be a matter of sincere gratification to every member.

All of which is respectfully submitted by your very obed't servant,

THOS. S. CUMMINGS, *Treasurer*.

New-York, May 13th, 1840.

After which, the following officers and members were elected :

SAMUEL F. B. MORSE, <i>President.</i>	AND'W RICHARDSON, } <i>Members of</i>
HENRY INMAN, <i>V. President.</i>	ROBERT E. LAUNITZ, } <i>Council.</i>
JOHN L. MORTON, <i>Cor. Secretary.</i>	G. MARSIGLIA, } <i>Academicians.</i>
JAS. WHITEHORNE, <i>Rec. Sec'ry.</i>	T. COLE, }
THOS. S. CUMMINGS, <i>Treasurer.</i>	E. MOONEY, }
	J. F. E. PRUDHOMME, } <i>Associates.</i>

Who, together with the Council, constitute the Committee of Arrangements for the next year's exhibition. The meeting then proceeded to the election of members :

Academicians :

D. HUNTINGTON, E. MOONEY, F. W. EDMONDS.

Associates :

W. H. POWELL, MISS S. C. FROTHINGHAM, J. W. AUDUBON,
V. G. AUDUBON, LEWIS P. CLOVER, T. P. ROSSITER.

Honorary Members :

JOHN FRAZEE, ORVILLE DEWEY, HENRY SARGENT,
ALFRED T. AGATE.

Prof. Perspective : HENRY BAYLIS, Esq. *Prof. Anatomy :* Dr. WATTS.

REVIEW OF THE EXHIBITION.

The fifteenth annual exhibition of the National Academy of Design is now open, and presents many pictures worthy of a place in any collection. It is daily crowded with the lovers of art, who are amply rewarded for their visit.

In such calamitous seasons to the trading community as the last, artists receive but few commissions, and consequently the friends of the institution feared the exhibition would not contain its usual attractions ; they have, however, been greatly and agreeably disappointed. There are some twenty pictures in this exhibition, which, alone, would be sufficient to entitle it to the highest praise.

It is unfortunate for the Academy that almost every visitor imagines himself a critic. Many, without discrimination or judgment, include the best pictures with the worst in a general censure ; sometimes, we are fain to think, from the first being beyond their comprehension. If these sapients would be contented with the large number of good pictures, (which is many times greater than could possibly have been anticipated) and recollect the fact that young artists can only judge of the power of their pictures by comparison with other and better works,

they would perhaps see the necessity of occasionally admitting the productions of juniors for their own benefit.

It may be unwise for us to find fault with brother editors; but as we intend that our criticisms shall be fearless, we must enter the field by attacking our own craft. The principal city journals have published criticisms on this exhibition, and really some of them are shameful. The pictures which one praises another pronounces worthless. Many are praised without desert; and others, truly deserving, are left unnoticed. Not contented with such errors, they occasionally draw comparisons between artists, which are as often erroneous as true: thus deserving aspirants are crushed, before their talents are fairly developed. It is morally wrong to publish criticisms written by those unacquainted with the arts; and the proprietors of papers containing them, should be punished as severely as those who tarnish the credit of a merchant or the character of a female. We do not intend these remarks to apply to *all* the critiques which have appeared, but are sorry to say that but few have been properly conducted. We know of one instance where the reporter of a paper was ordered to write a criticism; and after visiting the exhibition once, and that in the evening, he absolutely wrote a most definite denunciation against many of our best artists, and praised many very indifferent works.

Our space will not permit us to notice *all* the pictures: we shall therefore select those which, for their merits or demerits, most deserve attention.

No. 8. *Miniature of Rev. Dr. Wainwright; by G. Harvey, A.* We are sorry to be under the necessity of commencing our remarks by disapproving of this picture, as there is much about it to assure us that the artist can do better. He has made a bad choice of position for the hand, thereby requiring it to be so much foreshortened that he has failed in the drawing. The tone is too florid and general: the lower part of the head should contain more grey tones, instead of a local color of such sameness: it wants articulation, and thereby loses force.

9. *Design for a Hotel near West Point, in castle style of architecture; A. J. Davis, A.* This is one of the many good specimens we have seen of the fertile imagination of this architect.

Mr. Davis has done too much to improve the architecture of our city, to require praise from us.

10. *Engravings*; by *A. Sealey*. We are not sufficiently *au fait* to judge of the mechanical part of this gentleman's productions; but the engraving of W. Leggett, Esq. from a picture by Cummings, loses its force entirely, unless viewed within twelve inches. This may have been the fault of the painter; but from what we know of his works, we fear the fault is with the engraver. When viewed closely it is very creditable, and gives promise of future fame.

11 and 12. *Miniatures*; by *Miss S. C. Frothingham, A. (elect.)* These are truly good for one so young in the art. No. 11 has a fine, fleshy tone, and we could fairly be considered fastidious if we named a single fault.

13. *Frame of Miniatures*; by *Carl Weinedel, A.* All highly finished, with great labor. The likeness of the artist, by him self, is an excellent picture.

14. *An Old Building, at Kentish Town, London*; *J. W. Hill*. A free and spirited sketch.

17. *Spring, a miniature*; *G. A. Baker*. This is attempting more than can usually be successfully accomplished. There is much to please in the head; but the back ground and some of the accessories are faulty.

18. *Frame of two Miniature Portraits*; *T. S. Cummings, N. A.* These are in Mr. C.'s best style. The junior head is unquestionably the best we have ever seen in miniature: the drawing is fearless and correct, while the color and general arrangement challenge competition. We have had occasion to say much in favor of this gentleman's works; but never did we feel ourselves so inadequate to the task as in the present instance. The miniatures of Malbone and Cummings will long be remembered as the *chef d'œuvres* of American miniature painters.

20. *Engraving of the Rev. Orville Dewey*; by *H. S. Ladd*. We cannot withhold our commiseration, both for the original and the painter, (Mr. Frothingham.) So fine a head, and so good a picture, deserved better treatment.

28. *Portrait*; *J. H. Shegogue*. This portrait is extremely creditable as a composition, as are most of this artist's produc-

tions. The position is easy and classical, and free from that stiffness and constraint which is a frequent fault in portraits.

33 *Miniature Portrait of Thomas Fox, Esq.; T. Fox.* A forcible miniature, but in complexion a little chalky.

38. *Gipsy Girl; Miss J. Stuart.* Painted to a high scale of color, and much more forcible than some other pictures by this artiste.

42. *Full-length Portrait of a Child; C. C. Ingham, N. A.* The figure of the child is most accurately drawn and beautifully painted; but we feel compelled to disapprove of the back ground, which is leaden in tone, and wanting in ærial perspective.

43. *The Sisters; J. Whitehorne, N. A.* As likenesses, they are unexceptionably good, and form a very pleasing picture. This artist has advanced very rapidly, and will undoubtedly realize the fondest hopes of his friends.

44. *Portrait of a Lady; W. H. Powell.* A most able sketch or half-finished picture, full of fine classical taste, and would do much honor to an older artist. We have strong presentiments that this young gentleman is destined to astonish his friends.

49. *A View of the Mountain Pass called the Notch of the White Mountains; Thomas Cole, N. A.* The name of this artist is sufficient to guaranty its excellence. Mr. Cole has attempted much, and, as usual, has succeeded. The high scale of color necessary to represent American autumnal scenery, renders it a work of great difficulty; and even Turner, so celebrated for this particular style of art, might be proud to own the picture.

50. *Portrait of a Gentleman; D. Huntington, A.* This portrait contains one unusual excellence—a well-drawn hand: the other parts are fully equal to the artist's former attempts.

51. *Portrait of a Young Lady; C. L. Elliot.* The drapery and other accessories are too brilliant, rendering the picture rather a portrait of the dress than of the face. It is really inexcusable to introduce so much in a mere portrait: the eye is at once diverted from the head, which in this picture (if not in all others) is entitled to be the principal attraction.

52. *Portrait of Nicholas Biddle, Esq.; H. Inman, N. A.* A composition worthy of a Lawrence; for, although a portrait,

the attitude and general arrangement of effect fully entitle it to this appellation: coloring warm, glowing, and effective, and fully sustains the high reputation of the worthy Vice President.

54. *Portrait of J. Scholl, Apiarian; J. H. Shegogue.* Highly characteristic, and an excellent likeness of the philanthropic original.

58. *The Whistle, or The Infancy of Henri of Bearne; W. Page, N. A.* A daring and successful composition. The artist, as usual, has selected circumstances and arrangements of color replete with difficulties, all of which have been perfectly mastered. The child is not an exaggerated specimen of infantile beauty, but possesses all the nature and consequent departure from symmetry usual at so early an age. It is a general fault to paint children Cupids; whereas, artists should be content to let parents think them so. The head and hand of the father are admirably depicted, and the headdress of the mother is beautifully finished.

61. *Infant Juno: Portrait of a Little Girl; G. Marsiglia, N. A.* The whole merit of this picture is due to its finish: the drawing is faulty, and the accessories overwhelming.

63. *Portrait; Jas. Frothingham, N. A.* Pure in color, tone, force, depth, and strength: it lacks nothing, for it is a complete triumph of art.

67. *Scene near Pittsfield, Mass.; V. G. Audubon.* An admirable landscape, truly painted, and entirely free from clap-trap. The artist has copied nature with beauty and truth.

85. *Captive Knight; F. W. Philip, A.* A good cabinet picture, much in the style of Rembrandt, without at all losing originality. Mr. Philip has been six years in Europe, and made the most of his time. His studio presents several hundred specimens of his zeal, and his untiring industry will undoubtedly meet its just reward.

93. *The Architect's Dream; T. Cole, N. A.* A most gorgeous display of architectural beauties, and fully sustaining the high reputation of the artist.

103. *Landscape from Nature; Richardson, N. A.* One of Mr. R.'s happiest efforts, which are always pleasing when painted from nature.

105. *Child*; J. G. Chapman, N. A. We cannot understand how so good an artist as Mr. Chapman should produce a picture so entirely void of interest. It represents a child on a bed, in a state of nudity, apparently too young to raise its head, but still holding it constrainedly erect; and unless it was intended to represent the little subject as sliding off, there is some gross error in the drawing, for such is certainly the impression of every person visiting the exhibition. Each part, viewed separately, is well painted; but we have a right to expect the *tout ensemble* to be equal to the individual parts, in pictures emanating from such a source.

114. *Indian Girl*; J. E. Freeman, N. A. There is much to admire in this picture; and would the artist copy nature closely, and not attempt to represent her more gorgeous than she really is, he would undoubtedly improve his style.

126 and 133. *Landscape compositions—Morning and Evening*; A. B. Durand, N. A. We have on a former occasion given Mr. Durand the appellation of the “Admirable Crichton” of art. Nothing seems amiss to him. A few years since, he was unquestionably the first engraver in the country, and had few equals in Europe: in less time than would ordinarily be consumed in learning mere manipulation of materials, we find him equaling our first artists in portraiture and composition: another short space has elapsed, and he produces landscapes too full of beauties to be catalogued in a mere criticism. There is but one branch of art left for his restive genius to cope with; and that is sculpture: should he attempt it, we have no doubt of his success.

132. *Portrait of a Lady*; C. C. Ingham, N. A. The highest praise we can bestow upon the portrait of a lady, is to say it was painted by this artist.

160, 161, 162. *Portraits*; F. Cruikshank. These pictures are more effective and perfect than any we have ever seen executed with the same materials: they are painted with water colors, on Bristol board, and have all the force of oil. F. Cruikshank stands alone in this style of art. Did the collection contain no other pictures than these, it would be worthy of all the attention it has received.

183. *Disappointed Bachelor*; W. S. Mount, N. A. We are happy to see that the American Wilkie has at length turned his attention to this all-important course of thought; for unless he had done so seriously, he could never have produced so characteristic a composition.

195. *Portrait of the late William Dunlap, Esq.*; C. C. Ingham, N. A. This portrait of the late venerable Vice President is really a breathing likeness: we could scarcely convince ourselves that the original was not before us: his very character and disposition are depicted. We hope this picture may be purchased by the Academy.

220. *Portrait of General Hamilton*; J. Frothingham, N. A. In addition to other excellencies before named as belonging to this artist's works, the portrait before us bears an impressive style of grandeur or command worthy the original.

230. *The City and Country Beaux.* 234. *Sparkling*: F. W. Edmonds, A. These compositions are truly wonderful; and were they the production of one who had spent a life-time in the pursuit of his art, they would entitle him to a high standing. Mr. E. is an amateur, and does high honor to himself and country.

219. *Inhabitants of Athens celebrating the arrival of King Otho at the Tomb of Lysicrates*: J. Petzl. This picture is entirely wanting in a proper disposition of light and shade, and consequently its beauties are overlooked. Upon examining it closely, we were really surprised to find the figures, individually, well drawn and highly finished. Each by itself would form a gem; but the *tout ensemble* is spotty and disagreeable.

(TO BE CONTINUED.)

LUSUS NATURÆ.

A few weeks since we saw a horse in Baltimore with a worm in the aqueous humor of its eye. It had been observed for a month, during which time it had increased from one-half to three and a half inches in length. Its motion was continuous, as with an eel swimming, and the horse seemed to suffer no pain. The cornea was slightly opaque, and the eye will doubtless become prematurely blind. The worm is of the genus *filaria*, class *nematordia*, or thread-like worm of Rudolphi.

PROGRESS OF SCIENCE.

On the Galvanic Properties of the Metallic Elementary Bodies, with a description of a new Chemico-Mechanical Battery. By ALFRED SMEE, Esq. Communicated by the author.

Last May, a number of experiments were performed upon the galvanic properties of the non-metallic elementary bodies, and these were attended with the acquisition of some curious information, but till lately no opportunity has presented itself of extending the series of investigations then conducted: now, however, that I believe I can lay before the public a valuable battery, no time is lost, that others may extend and improve the new principle about to be detailed.

With regard to the metallic elementary bodies, their properties have been investigated so frequently, and to such an extent, that it may seem unnecessary to draw attention again to them; but two circumstances influencing their action have never been noticed. It is well known that the positive metal should be the most readily acted upon by the solution, and the negative the least, and the further these are apart, the more forcible will be the battery: thus, *cæteris paribus*, platinum and zinc are more powerful than iron and zinc; but if a circuit be made of a piece of smooth platinum and zinc, it will sometimes happen that the effect is less than when a circuit is formed by a similar piece of iron. Now this appears at first sight paradoxical, though it can in many instances be easily explained; for if the platinum be carefully examined, it will be seen that the acid solution does not really wet the platinum, but runs off from the greater part of the surface, as metallic mercury does from glass. In this state, a piece of platinum having a surface of thirty-two square inches, formed into a battery with amalgamated zinc, and connected with a magnet, supported three-quarters of a pound through five thicknesses of paper: when the same piece of platinum was heated or dipped in nitric acid, and afterwards well washed, it supported a similar weight through twelve thicknesses of paper: thus being less powerful than iron in the first instance, and more so in the second. In the same way, silver supported, under the like circumstances, the keeper of a magnet through three layers of paper: on being heated and again wetted, the attractive force was exerted through nine thicknesses of paper, but no additional power was gained by removing the surface of the silver by nitric acid. The metals in these cases appear to become coated with a film of air, which effectually prevents the contact of the fluid. This is also seen in the various forms of charcoal, which after ignition are very powerful, but lose much of their force if long exposed to the air; their energy however is restored upon their being again heated.

As in the experiments just detailed, and in those which I am about immediately to describe, the relative powers of the arrangements have to be considered, it will be proper to mention in what way the results were obtained. A soft iron horse-shoe magnet was suspended, round

which covered wire, in communication with the poles of the battery, was wound: the keeper, which weighed three-quarters of a pound, was separated from the poles of the magnet by as many layers of thin blotting-paper as could be used without its falling: thus with a battery of feeble force, few layers of paper could be interposed; but with one of greater strength, forty or sixty thicknesses might be used. A similar form of apparatus might easily be devised, which would show by means of a delicate screw the exact distance at which a given weight would be supported by the attractive force of the induced magnet.

The influence of different conditions of surfaces is a subject which has escaped all experimenters. Now this is singular; for many must have noticed, that in a circuit, the greatest quantity of gas is given off at the corners, edges, and points. Following this hint, a piece of spongy platinum, consisting as it does of an infinity of points, was placed in contact with amalgamated zinc, when a most violent action ensued, so that but little doubt could be entertained of its forming a very powerful battery. The fragile nature of this material precludes it from being thus used, and therefore it was determined that another piece of platinum should be coated with the finely-divided metal. This experiment was attended with a similar good result, and the energy of the metal thus coated was found to be surprising. To test the value of this process, a piece of platinum, thus platinized, was placed in dilute acid in contact with amalgamated zinc, and the quantity of gas evolved in a given time was noticed.

Platinized platinum,	7 sq. in.	gave off	5 cub. in.	per	1 min.
Platinum heated,	"	"	1	"	"
Platinum covered by air,	"	"	1	"	6 min.
Platinized coke,	small piece,	"	3	"	5 min.
Plain coke,	"	"	1	"	25 min.

In these experiments the contact was made in each cell alike; the same zinc being used, and the distance being the same between the metals. The energy of the metal thus prepared upon the soft iron magnet is very great. A piece of platinum exposing thirty-two square inches of surface, supports three-quarters of a pound through seventeen thicknesses of paper, whilst when smooth and wetted it supported it through eleven layers; and when no care was taken about its being wet, but when simply plunged into the liquid, only through five layers of the same paper.

The cause of this increase of power appears to be the facility given to the evolution of the gas from the number of points, and not from an increase of surface, as but little benefit attends its application in the nitric acid batteries, in which the hydrogen is not evolved, but absorbed by the fluid.

The next point which we have to consider is, whether other finely-divided metals have the same good effect; but no other of the many metals that I have tried can be used with similar good results, except palladium, which though it has not much effect in the sponge, is found when precipitated on platinum or silver, to possess powers about equal to the finely-divided platinum. Precipitated silver increases the power of the metals, but not nearly to the extent of platinum.

Having ascertained that a solution of platinum must be used for increasing the power of metals in their ordinary state, it becomes a matter of great importance to ascertain whether the platinum may be precipitated upon other metals with advantage; and for this purpose it was deposited upon earthenware, palladium, pure silver, copper plated with silver, nickel, German silver, tin, lead, brass, cast iron, sheet iron, steel, zinc, and charcoal. The platinized earthenware was not found to answer, apparently from the quantity of the metal not being sufficient to carry the electricity. Palladium, silver, and plated silver answered equally well with platinum to receive the precipitated metal, and if there was any difference, I think the silver was rather the best. Plated copper answers very well, but care should be taken to varnish every copper edge, or else that metal is apt to be slightly dissolved, and deposited again upon the platinized silver, which is injurious. Should copper from any cause get upon the silver, it may be dissolved by a little muriatic acid, and afterwards by a little strong ammonia. No other metal or alloy besides this answered for the reception of the platinum, except iron, and this was as active as silver for a time, but then a local battery was formed between the platinum and iron—the iron was dissolved and the battery destroyed. In some cases this does not take place so rapidly as in others. Carbon answers admirably for the reception of the platinum, and is improved in like manner.

We have now the elements for the manufacture of a powerful battery; for we have seen that increase of power is obtained by taking care that the negative metal is thoroughly wetted by the fluid, and that this is not only accomplished, but its power materially increased by the numerous points formed by the precipitation of finely-divided platinum. Whatever metal, alloy, or compound may be found hereafter to succeed for the reception of the platinum, or whatever metal may be found to answer instead of the finely-divided platinum, still the principle by which the advantage is gained will be the same. However, the battery which I now propose is to be made of either copper plated with silver, silver, palladium, or platinum. The silver can be rolled to any thinness, and therefore is not expensive. Each piece of metal is to be placed in water, to which a little dilute sulphuric acid and nitro-muriate of platinum is to be added. A simple current is then to be formed by zinc placed in a porous tube with dilute acid; when, after the lapse of a short time, the metal will be coated with a fine black powder of metallic platinum. The trouble of this operation is most trifling, only requiring a little time after the arrangement of the apparatus, which takes even less than the description. The cost I find to be about 6d. a plate, of four inches each way, or 32 square inches of surface. This finely-divided platinum does not adhere firmly to very smooth metals; but when they are rough, is very lasting, and sticks so closely that it cannot be rubbed off. On this account, when either silver is employed, or copper coated with silver, the surface is to be made rough by brushing it over with a little strong nitric acid, which gives it instantly a frosted appearance; and this, after being washed, is ready for the platinizing process.

With regard to the arrangement of the metal thus prepared, great diversity exists. It may be arranged in the same way as an ordinary Wollaston's battery with advantage; a battery thus constructed, pos-

sessing greater power than Professor Daniell's battery: four cells, containing 48 square inches in each cell, decomposed 7 cubic inches of mixed gas per five minutes, whilst four cells of Professor Daniell's, in which 65 square inches of copper were exposed in each cell, gave off only five cubic inches in the same time. However, in my battery thus arranged, the action dropped to 5 cubic inches in five minutes, but it resumed its power after the contact had been broken for a few seconds. This battery also possesses great heating powers, raising the temperature of a platinum or steel wire, one foot long and of a thickness similar to that used for ordinary bird-cages, to a heat that could not be borne by the finger.* Its magnetic power is not less astonishing; three cells supporting the keeper of a magnet through 45, two cells through 32, and one cell through 20 thicknesses of paper. An electro-magnetic engine was made to rotate with great velocity; the combustion of the mercury at the breaking of contact being exceedingly brilliant.

A battery of this construction should be in every laboratory, to be used in most cases where a battery is wanted, and the slight labor attending its operation is scarcely worth mentioning. I have used one for 48 hours consecutively, without the slightest alteration either of the fluid or in the arrangement of the metals, and the diminution attending its operation appeared to arise from deficiency of acid; for it was instantly restored by a little strong sulphuric acid in each cell. Where the battery is required to possess the same power for a long period, it might be advisable to separate the metals by a porous earthenware vessel, or what answers the purpose equally well, by a thick paper bag, the joinings of which must be effected by shell-lac dissolved in alcohol. By these means, the sulphate of zinc is retained on the zinc side of the battery. The use of porous tubes, however, appears from observation, as far as my battery is concerned, to be nearly superfluous—at any rate in most cases; for I find, that after a battery arranged as Wollaston's, had been at work in the same fluid for 48 hours, it had no zinc deposited on the silver. It is worth remarking, that during the last 24 hours contact had not been broken for a single instant. Notwithstanding these experiments, however, it may be as well in an extensive battery to use porous plates.

The battery may be arranged like the pot batteries; but I should greatly prefer the troughs, such as used for Wollaston's batteries, from the convenience of packing, and from a battery of the same surface requiring so small a space. A battery may be constructed to form a most powerful calorimotor. It may also be arranged as a circular disc battery. Or it may be made as a Cruickshanks, each cell being divided or not by a flat, porous diaphragm. Whatever arrangement is adopted, the closer the zinc is brought to the platinized metal, the greater will be the power.

The generating fluid which is to be employed is water, with one-eighth of sulphuric acid by measure; and the zinc ought always to be amalgamated in the first instance, as that process will be found very

* A small pot battery of six cells, fairly fused into globules two inches of iron wire, and the combustion of different metals was extremely brilliant, when the battery was in combination with a Bachoffner's apparatus.

economical from its stopping all local action, and the amalgamation will be found not to require repeating, because there is no fear of copper being thrown down on the zinc, which occasionally happens in the sulphate of copper batteries.

The battery thus constructed is the cheapest and least troublesome in action that has ever been proposed, and from the smallness of its bulk will be found very valuable to electro-magneticians. It is second in power only to the nitric acid batteries, the objections to which have been already noticed. For medical purposes, with a Bachoffner's apparatus, a battery composed of platinized silver two inches each way will be found sufficient.

To recapitulate the processes of the formation of a battery: first, the platina, silver, or plated copper must be roughened, the two latter with nitric acid, and afterwards washed. The metal is next to be placed in an acid solution with a little nitro-muriate of platinum, which metal is to be thrown down by the formation of a simple galvanic circuit; and lastly, the platinized metal is to be formed with amalgamated zinc into a battery, either with a porous tube or paper bag, or without them, according to the fancy of the operator, or the purpose for which it is wanted.

The advantage from this form of battery arises, as I believe, from a mechanical help to the evolution of the hydrogen; and therefore it is proposed to call it the chemico mechanical battery. This battery may remain in the acid for a length of time, and neither the amalgamated zinc nor platinized silver will undergo the slightest change, and the whole will be as silent as death. Let only communication be made, the liquid in each cell becomes troubled; it boils—it bubbles—and produces the effects which have been detailed. The quantity of electricity passing through either wires or liquids may be pretty accurately judged from the action taking place in the battery, for if the communication be made through a liquid of difficult decomposition, or through long small wires (70 or 80 feet), but little gas will be given off from the platinized metal; but when short, thick wires are used, the action is violent. A galvanometer might be constructed of one cell, similar to the oxygen cell of Professor Daniell, as this would show the exact amount of electricity passing.

The importance of constructing a battery that shall be small in compass, efficient in action, cheap in its operation, and devoid of troublesome manipulation, is important in the highest degree; and I consider that my chemico-mechanical battery will be found frequently a useful means of obtaining gases for the oxy-hydrogen light. Its value for blowing up vessels under water, and exploding powder in mines, is sufficiently obvious.

In conducting the extensive series of experiments, of which this is a summary, the grand features have been rather attended to than very minute results; and in conclusion, it would ill befit me if I did not here mention the valuable assistance I have received by the loan of apparatus, &c. from many individuals, but most especially from Professor Daniell, William Terry, Esq. and Mr. E. Palmer.

London and Edinburgh Phil. Mag.

On the best means of burning Gas for supplying Heat. By Sir JOHN ROBISON.

When carburetted hydrogen gas is employed in producing heat, it is seldom required that it should at the same time give out light: the combustion may therefore be managed in any way which may be convenient, without seeking to preserve the illuminating power. It appears to have occurred about the same period to the late Dr. Duncan and to myself, that, by passing a current of gas, mixed with atmospheric air, through a wide vertical tube, having its upper end covered by a diaphragm of wire-gauze, and by kindling the mixture as it escaped through the interstices of the wire-cloth, a convenient stove might be formed for culinary purposes. Dr. Duncan applied some small apparatus on this principle to pharmaceutical operations in his class-room, and I had my kitchen furnished with a range of large stoves, which were intended to supersede the use of French charcoal-stoves in various culinary processes. In both cases the success has been perfect, and the same principle has since been adopted with advantage in a variety of processes in the useful arts, where this neat and cleanly method of applying heat has rendered it a valuable acquisition to the work-shop. The form of the apparatus may be varied in any way to suit the particular process to which it is to be applied; as all that is essential is, that a current of the mixed gas and air shall rise through wire-cloth, and that the proportion of gas to atmospheric air shall never be so great as to allow of the flame becoming yellow, as, with this precaution, the combustion of the carburetted hydrogen will be complete, and no deposit of soot will take place on cold bodies when set over the flames: the proper quantity of gas in the mixture is easily determined by the stop-cock belonging to each stove.

For ordinary culinary purposes, the cylinders may be thirty inches long, and three to four inches diameter, and the wire-cloth for the tops should have about thirty wires to the inch. That which is manufactured for safety-lamps answers well for this purpose.

Whenever, from accidental injury or decay, a hole takes place in a diaphragm, it is no longer possible to use it; as, when lighted, the flame passes through the fracture, and communicates with the jet at the bottom of the cylinder, which then burns like an ordinary gas-light, and like it, would blacken the surface of any cold body presented to it. The wire-cloths, if not broken through by violence, will last for months although in daily use; and, if covered by a layer of coarse sand or pounded limestone, will continue serviceable for an unlimited period.

When more intense heat is required than is attainable by the unaided combustion of the mixed gases, recourse may be had to various forms of blow-pipes; and when a large volume of such flame is to be employed, the current of atmospheric air may be urged by double bellows. A very efficient apparatus on this principle is to be seen in the laboratory of Dr. D. B. Reid.

It is to be regretted that such applications of gas are not more generally known and introduced into workshops, as there are numerous processes in the arts in which they would afford facilities to the workman which he can scarcely command by any other means. For example:

in the hardening of steel tools, it is well known that a piece of bright steel, when heated to redness in a forge or muffle, is subject to oxydation, and that a black scale remains after hardening, which it is difficult to remove without some injury to the work, as in the case of a screw-tap; whereas, if the same piece of steel be heated in a flame of the mixed gases, where there is no free oxygen to attack its surface, it may be *made and kept* red-hot without any injury to its finest edge: it will be discolored, but without losing much of its polish. The artist has also the advantage of a distinct view of the article while it is being heated, and the power of withdrawing it from the flame the moment it has acquired the proper color, which, in the hardening of cast-steel cutting tools, is of great importance.

Many attempts have been made to apply carburetted hydrogen and pure hydrogen gases to the purposes of warming buildings, and various forms of stoves have been proposed, on the understanding, it would appear, that by applying the flame of the gas to metallic bodies, an increased degree of heat would be communicated by them to the atmosphere around. A little consideration will show, that however the *distribution* of heat may be modified by such contrivances, there can be no increase of the heating power; and that when a certain measure of gas is fairly burned, the heat evolved into the apartment will be the same, whether the flame be disposed as a light, or made to play against metallic plates or other combinations of apparatus. In all cases where the products of the combustion are allowed to mix with the atmosphere of the apartment, without provision being made for carrying them off by ventilation, the effects of such processes must be more or less deleterious to health, according to the proportion these products bear to the mass of air they mix in. On the whole, it may be assumed, that this mode of heating apartments is the most expensive, the least efficient, and, excepting that by Joyce's charcoal stove, the most insalubrious that can be resorted to.

Edinburgh New Phil. Jour.

On the best method of burning Gas for the purpose of Illumination.
By Sir JOHN ROBISON.

The theoretical principles on which carburetted hydrogen gas may be used with the best advantage, for the purpose of domestic illumination, have been so well laid down by the late Dr. Turner, and by Dr. Christison, as well as by other chemists, that it would be superfluous to enter at all on this part of the subject in a paper, the object of which is to give such practical directions for the proper construction and management of gas-fittings, as may lead workmen to give the requisite forms and proportions to the parts, and may enable the consumers to obtain the quantity of light they require, from the smallest practicable expenditure of gas, and with the least possible inconvenience from the product of its combustion.

It is very generally believed by workmen and others, that the more freely the current of air is admitted to an argand burner, the better will be the light; and hence the burners and glass chimneys in ordinary use are made in such a way as to favor this view. No practice, however, can be more incorrect, or can lead to less economical results. An

attentive observation of what takes place will show, *that there is only a certain proportion of air required for the favorable combustion of a definite measure of gas.* If more air than this due proportion be allowed to pass up the chimney, the size of the flame will be reduced, and the quantity of light diminished: if, on the other hand, less than the due proportion be admitted, the surface of the flame will be increased by elongation, but it will become obscure, and the quantity of light will decrease, owing to the escape of particles of unconsumed carbon. A simple experiment will exemplify this. If the flame of an ordinary argand burner be reduced, by partially shutting the cock, to about half an inch high, the light will be pale and blue, because the supply of air is too great for the small quantity of gas which is issuing. If partial obstruction be given to the access of air, by applying a handkerchief under the burner and chimney, it will be found that the size of the flame and the quantity of light emitted will increase until it arrive at a maximum, when, by farther obstruction, the admission of air will be reduced below the proportion required for the burning of the carbon, and the light will diminish.

It appears, therefore, that the proportionate size and shape of the burners, and the diameter and height of the glass chimneys, are by no means indifferent matters, but that much advantage may be gained or lost by giving them such forms and proportions *as may insure the development of the maximum degree of light which the gas is capable of affording.*

As a general rule, it may be considered that in all burners, whether well or ill made, the greatest quantity of light, *in proportion to the gas expended,* will always be obtained when the flame has been raised as high as it will go without smoking. In proof of this, the following experiment may be made: In any situation where there are three or four burners of the same size, and with similar chimney-glasses, and receiving their gas through a meter (by which the expenditure may be measured), if one of these burners have its flame elevated as high as it can be made to burn without smoking, and if its expenditure per hour be accurately noted on the meter; if the other two or three burners be then lighted, and their flames be so regulated that their united lighting power shall be just equal to the large flame of the first burner, it will then be found, on noting the expenditure, that it is much greater than in the case of the equal light from the single burner, and that the first burner, which gives light equal to two others, consumes but two-thirds of the gas which they do; or, if it be compared with three others giving together an equal degree of light, its consumption will be little more than half of theirs. It follows from this, that when a certain degree of light is required, such a burner should be employed *as is capable of giving this light and no more,* and that it is bad economy to use a more powerful burner with a flame of less than its due height. This rule holds good with any number of burners, and is equally true whether they be well or ill made.

The same rule will apply to the individual jets of an argand burner, as holds in regard to their united effect, and if, in any burner, the jets be of unequal heights, in consequence of bad drilling of the apertures, or neglect of keeping them free of dirt, the consequence will be, that

when the flame is raised until the jet from the widest hole reaches the most advantageous height, those from the obstructed holes will be consuming the gas at a disadvantage, which will be greater or less according to circumstances, but will always be of greater amount than is generally supposed.

The experiments made by Drs. Turner and Christison serve to show, that much smaller chimneys than those usually employed, are required to burn the gas to the best advantage. Unfortunately, however, the dimensions most favorable to economy in one respect, are beyond the limits of economy in another; and when the glasses are made small enough in diameter to obtain the maximum of illuminating effect, they are liable to be softened by the heat; or to be cracked, *if not accurately centered*. A compromise between the two evils must therefore be made, and if this be judiciously done, *a great improvement on the usual routine practice may be effected, a more beautiful and steady light be obtained at a less cost, and our domestic comfort be increased, by the diminution of the heat and effluvia of the gas.*

For practical purposes, therefore, the following directions may be observed:

Whatever diameter is given to the burner, the glass chimney should not exceed it by more than half an inch at the utmost. If the burner be less than three-fourths of an inch in diameter, the chimney-glass should not exceed $1\frac{1}{2}$ inch in internal diameter. In any case, its height should be no more than four inches above the mouth of the burner from which the jets spring.

The smallness of the interval which is in this way allowed between the flame and the glass, renders it necessary that the workmanship of the supporting gallery be accurate, *in order that the chimney may be held perpendicular, and truly concentric with the flame*. Gas-fitters rarely give sufficient attention to this important point, and a large share of the expense from broken glasses is owing to defects in this particular.

In the ordinary mountings, the gallery is put on the burner, which it seldom fits accurately, the glass likewise rarely fits tight into the socket of the gallery; and from these two causes, it is often so much off the centre, or so far from being upright, that the flame cannot be raised to a proper height without risk of breaking it. This risk may be greatly diminished by a little change in the disposition of the burner and gallery. Instead of hanging the gallery on the burner, it should be placed beneath it, and fixed by screwing down the burner on it. In this case, it is necessary to give the gallery an increased diameter, as the air, both for the inside and the outside of the flame, must enter through its ribs. The burners should also be made conical instead of cylindrical; but this is not so important as drilling them with numerous holes—at least double the number usually allowed, as the closer they are the better, the expenditure being regulated by the stop-cock, and not by the number of holes.

In making the galleries, great attention should be paid to having the rim and seat for the glass truly concentric with the hole through which the nozzle-screw, on which the burner is fixed, passes; the workmen should have a solid wooden chuck of the size of the bells of the chimney-glasses, and should chuck the galleries on it, in order to drill the aper-

ture through which the nozzle-screw is to pass. The outside and inside faces of this hole should at the same time be turned true, as, if this be done with the proper care, the glass, the burner, and the gallery, will all be true to the same axis, when they are put together and screwed up. The hole through the gallery should not be tapped, as the burner is sufficient fixture for it when screwed down over it. If this part of the work be well executed, even an indifferently made burner will perform well; and if it be ill done, the best burner will appear defective, and be liable to break the glasses.

The arrangement of burner and gallery here recommended, is not incompatible with the use of plain cylindric glasses, but it will be found better to use what is sometimes called the French-shaped chimneys; that is, those which are used with the common argand oil-lamps. The wideness of their mouths gives them a firm seat in the gallery; and if the length of the bell, or wide portion of the glass, be such that the neck or choke shall be on the level of the lip of the burner, and the upper part of the glass be four inches to four inches and a half long, then a favorable result will be obtained. It is expedient to obscure the lower part or bell of the glass, as the burner is thereby concealed, and the flame appears to rise out of a thick wax candle. No moon-shades should ever be used, as, besides intercepting a considerable portion of the light, they prevent the consumers from observing whether the burners and glasses be in good order, and performing properly.

It is pretty generally imagined that the smoking of ceilings is occasioned by impurity in the gas; whereas, in this case there is no connection between the deposition of soot and the quality of the gas. The evil arises either from the flame being raised so high that some of its forked points give out smoke, or more frequently from a careless mode of lighting. If, when lighting lamps, the stop-cock be opened suddenly, and a burst of gas be permitted to escape *before* the match be applied to light it, then a strong puff follows the lighting of each burner, and a cloud of black smoke rises to the ceiling. This, in many houses and shops, is repeated daily, and the inevitable consequence is a blackened ceiling. In some well-regulated houses, the glasses are taken off and wiped every day, and before they are put on again, *the match is applied to the lip of the burner, and the stop-cock cautiously opened, so that no more gas escapes than is sufficient to make a ring of blue flame*, the glasses being then put on quite straight, the stop-cocks are gently turned, until the flames stand at three inches height. When this is done, few chimney-glasses will be broken, and the ceilings will not be blackened for years.

Gas-fitters and lamp-makers generally put the stop-cocks in situations where it is difficult to get at them, and they make their heads so small, that, if they be in the least degree stiff, it is not easy to turn them gradually; hence, when a little force is applied, they move by starts, and the flame is sometimes raised too high, or, instead of being a little lowered, is altogether extinguished. The remedy for this inconvenience is, to make the cocks easily accessible to a person standing on the floor, and to make their levers so long that their movements may be easily graduated. The cocks and levers may easily be designed so as to form part of the ornamental work of the lamps.

The argand burner being the most perfect and economical which can be used, unless where small portions of light are required, it is unnecessary to say anything of the bat-wings and other fancy burners, especially as the only precaution to be taken with them, is to take care not to raise them so high as to smoke, and never to use two or more low flames, when the same degree of light can be got from one flame burning at its most effective height.

A mode of supplying argand burners with a current of heated air has been lately proposed in Paris, and much praised in London. This is effected by having an outer glass of a diameter a little larger than the inner one. This outer glass reaches farther down than the bottom of the burner, and is closed below by a metal plate; the air for the supply of the flame is made to pass down between the outer and inner glasses, where it gets heated; it then enters the inner glass and the centre aperture of the burner, and passing upwards, supports the combustion of the gas in the usual way. There is no doubt that, by this arrangement, a considerable improvement may be made in cases where ill-made burners, with wide and tall chimney-glasses, are employed; but if the experiment be tried with burners and glasses proportioned in the way recommended above, it will be found that no advantage is gained, and that the maximum effect has been attained by a simpler apparatus.

Before quitting the subject of burners, it may be right to advert to a frequent cause of disappointment in their performance. The perfection of an argand burner is, *that the flame arising from it should appear in a continuous cylindric sheet, with a smooth upper edge, and without forking points.* This is sometimes very difficult of attainment, however carefully the jet-holes may be gauged by the pricker. There are two causes for this irregularity: one is, that, if the drill which is used be blunt, a little blaze is pushed aside by it, when it is forced through the plate in which the jet-holes are pierced; this blaze adheres to the edges of the hole, and interferes with the passage of the gas, and being unequal in its effects, renders the flame forked. The other cause is, that the inside of the burner is seldom turned true, and that the shoulder in which the pierced disk rests is not of equal width all round, and sometimes may be so thick in some places that the drill when it gets through the disk, strikes against the shoulder; this likewise interferes with the issue of the gas. To avoid these causes of irregularity, the following precautions are essential: When the seat for the disk is turned out, the inside space between the inner and outer walls of the burner should be turned true for a quarter of an inch inwards, and no more shoulder should be left than just enough to support the disk in its place. The disk should then be put into its seat, but not finally fixed. The requisite number of holes should then be drilled in it, and slightly counter-sunk to take off the barb. The disk should then be reversed, (that is to say, the counter-sunk face should be put inwards) and finally fixed in its place. The blaze which may have been pushed through with the drill will now be on the outside, and may be easily removed by the file, or by a slight counter-sinking, which is the preferable manner, as the smooth-edged holes will keep longer clean than those with a sharp arras, the application of an old tooth-brush being sufficient to keep them in good order.

The above observations apply chiefly to the illumination of the interiors of buildings, and it may be proper to notice the circumstances which require to be attended to in lights which, being placed externally, are in some degree exposed to the weather. The most important of these are the street lamps. These may either be arranged at considerable distances, and be fitted with powerful burners, or the intervals between them may be smaller, and only a single jet be allowed for each. Various local considerations must determine this, as well as some other points; but it should be kept in mind, that the best small light is either the single jet of $3\frac{1}{2}$ or 4 inches high, or the fish-tail jet of 3 inches high, and that for more powerful lights *the argand is preferable to all others*. The large bat-wing, so much used in large public lamps, is wasteful, smokes the lantern, and does not give light in proportion to its expenditure.

In most towns, framed square lanterns are used for street lamps, as it is said that globes are apt to be obscured in cold weather by the deposition of the water generated by the combustion of the gas. It is no doubt true, that if proper precautions be not taken, this inconvenience would be felt, and the water which would trickle from the aperture in the bottom of the globe would be liable to freeze in severe weather, and so to close up the access for air, that the lamp would smoke or go out. In all other respects, globes have undeniable advantages over framed lanterns, as they protect the flames better in high winds, and they are kept up at much less expense.

Some years ago I pointed out to the Commissioners of Police of this city, that advantage might be taken of the acknowledged good properties of the globes for lighting the streets, and the alleged defect be obviated by constructing the tin tops with chimneys which should reach down to the points of the flames, and by their current carry off the water while still in a state of vapor, and so prevent it from being condensed on the sides of the globes. This plan was immediately tried; and having been found successful, was adopted in all the lamps erected subsequently. It occasionally happens, that from the jet being deranged, the gas is directed past the tin chimney instead of into it; and if the weather be cold, it is immediately observed that a deposition of water takes place inside the globe, and its sides become dim. The adjustment of the burner restores the proper action, and the globe remains bright. This plan having now stood the test of many years' experience, may safely be recommended for adoption wherever new street-lamps are erected.

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STEAM BOILER EXPLOSIONS.

The following is extracted from a lecture upon heat and its effects, delivered before the Truro Institution, by J. Sims, Esq. engineer.

"And here I beg to call your attention to a few brief remarks on steam boiler explosions, which I have been led to make in consequence of the many distressing accidents that have occurred in this county during the last few years, and which I am sorry to say have been lamentably destructive of human life. I more particularly refer to the Cornish engines than any others, because we, in Cornwall, work

with steam which is generally termed high pressure, that is varying from about 10 lbs. per square inch, to 50 lbs. per square inch, and this in proportion to the load of the engine and the opinion of the engineer in point of economy of fuel. In making these remarks I have called to my aid the opinions of some of our most eminent engineers in conjunction with a long and extensive practice of my own, and taking into the account the very great increase of steam engines out of Cornwall, exactly on the plan now in general use in this county, it calls loudly on all who are or may be employed in the construction of the steam engine, more especially in that part of it which is termed the boiler or steam generator, to so modify the thing as to render it safe as possible, and to make use of steam, which would be much more safe in its operation and equally beneficial, so far as regards economy of fuel. The form of boilers now in use in Cornwall, is cylindrical, having a cylindrical tube; the general size is about six feet six inches diameter, with tube varying from about three feet nine inches to four feet diameter; about six feet long of this tube is used as the furnace or fire place, consequently the whole of the fire is surrounded by water. Various opinions have been suggested of the causes of explosions; some attributing them to the igniting of explosive gases generated within the boilers themselves; but I think this opinion is not based upon any satisfactory or valid foundation. Under certain circumstances hydrogen gas may be formed inside a boiler, in consequence of the overheated iron plates decomposing the water of the steam by abstracting and uniting with its oxygen; but the circumstances under which this process may go on, I conceive must be exceedingly rare, and the effect of very trifling amount. If it were possible for the gas to be formed in any considerable quantity, the circumstance must be immediately known by the very perceptible effect it would have upon the working of the engine; or how, I would ask, is the gas to become of greater pressure than the steam, even if the engine should not be at work, when there is the same aperture for its escape? There is one fact of so strong and irrefragable a character that in my opinion it decides the fate of this hypothesis, and clearly proves that steam boiler accidents cannot be attributed to the explosion of gases. The fact alluded to is this, that an explosion or a collapse in the numerous class of low pressure boilers is a thing never heard of, while it is too frequent among high pressure boilers; although it is certain that the low pressure boilers are quite as likely to form the gases as the latter. The plates of the fire places and flues of low pressure boilers are quite as likely to form the gases as the plates and flues of high pressure boilers, because the low pressure boilers are probably quite as much exposed to the mischance of becoming red hot, and from their great capacity, are likely to hold the gases in greater abundance; but notwithstanding, in low pressure boilers no explosions do take place, no fatal accidents, no loss of life. I think in doing away with the opinion respecting gases, the causes of steam boiler explosions may be classed as follows. 1st. In the improper form of the boiler, being insufficient to bear the pressure of steam which the engineer may think proper to use. 2d. In the neglect of the engine man allowing the water to get below the back of the tube, which is the back of the fire-place, thereby allowing that part

to be heated to a very high temperature, and of course rendering the iron weak and less capable of bearing the pressure of steam, which is in proportion to that temperature. 3d. By being weakened by wear, and not proper attention paid to lessen the pressure of steam in proportion to that wear. But I fear that the greater number have exploded by means of using steam of an unnecessary pressure; and in order to render this fact as clear as possible, I beg to remark here that the Cornish engineers in carrying out the great principle of working steam expansively, and which principle has been the means of causing the Cornish engines to exceed all others in point of economy of fuel, I say they have (myself amongst them) lost sight of one important feature in this principle of expansion, which is that of omitting to have the apertures for the admission of steam from the boilers to the steam cylinder of a proper size, or of a size large enough for the proper admission of the steam in proportion to the load of engine and pressure of steam required. The consequence is that it is found necessary to have steam in the boiler of a much higher pressure than would be necessary, provided the aperture from the boilers to the cylinder had been a proper size—and this is in a ratio proportionate to the load of engine and rate of expansion. This important feature in the steam engine has been so far neglected that I have known a seven inch aperture *only* used for the admission of steam on a seventy inch piston. The area of the seventy inch piston being upwards of one hundred times as much as the area of aperture or valve for the admission of steam, it becomes a natural inference that so small an aperture could not possibly supply one third of such large cylinder in about a second. I mention one third of the cylinder, because that is about the average distance which the pistons do descend before the steam from the boiler is cut off, the remaining part of the stroke being performed by the expansibility of the steam which entered the cylinder for that one third of stroke. The consequence of having such small apertures is, that it is found necessary to have steam in the boilers of a pressure very much above what would be necessary, provided the steam pipes and steam valve had been of a proper size; and this inconvenience becoming more as the load of engine increases, I fear that explosions of the worst character have taken place in consequence. I have reason to believe that the present cylindrical boilers in use in this county are as safe with thirty pounds per inch pressure, as the old low pressure boilers were for the steam they used; and in all the steam engines which I have the management of, I have made it a rule for some years that I would use steam of no higher pressure; since which, I have had no explosion nor anything in the shape of a serious accident. The average duty of the engines has been above what it was before, and the boilers will last a considerable time longer. Respecting the lamentable explosion which took place at the Consolidated Mines, a short time back, the distressing effects of which must still be fresh in your memories, it was stated that it must have been caused by the neglect of the engine man in allowing the water to get below the back of the tube; and the reason assigned for this was, because that boiler was said to be the strongest, and must have been weakened by heat to cause it to explode; and the other two boilers, which it was said were not so strong, remained uninjured.

The strength of cylindrical boiler tubes to resist an external pressure, exerted on its outward surface, is a very different thing from the strength of the same tube to resist an internal pressure; because when the force is exerted on the inside of the tube, and tending to burst or rend it asunder, the relative strength or power of the tube is very easily estimated. But in the other case, when the pressure is external, the strength of the tube to resist such pressure will depend upon very different principles. The tube in this case depends for its strength on the perfect state of the circle of which it is formed, and the thickness of the plates; and it must be clear that steam of from forty to fifty pounds per square inch, acting on an arch of about four feet span, made of half plate, will cause that arch which is most imperfect, to collapse first; and that if a tube has got any defect as to form, so as to render it a more imperfect arch than the next boiler alongside of it, it will yield to the pressure before the other, although in appearance it was the strongest boiler; and further, the one with the imperfection is weakest, in proportion to the amount of the imperfection, and the liability to explode becomes more, in proportion to the increased temperature and pressure of steam, thereby rendering the plate more weak through heat, consequently less capable of resisting the increased pressure; and really if we look at an arch of four feet span only, made of iron plate of half an inch thick, considerably weakened by heat, and with a force of fifty pounds per square inch acting upon it, and unavoidably imperfect as to form, it becomes a matter of very little surprise to find they will collapse. Under all these circumstances it appears to be too much to say of boilers, having just the same appearance, which is the strongest. If it were possible to form a tube of a boiler to a perfect circle, which would be the true figure of greatest resistance, there is little chance of its remaining so; the expansion and contraction, together with the increased pressure against the bottom of the tube in proportion to the height of water in the boiler, which gives upwards of three pounds per inch pressure more there than in the top of the tube, has a strong tendency to injure its circular form. The imperfect form of tubes to support an internal pressure is not of so much consequence, because the pressure tends to improve the form; but with an external pressure the contrary effect takes place. The extraordinary effects which often take place by means of boiler explosions, I consider are in proportion to the quantity of fire in the furnace or tube, and quantity of water in the boiler, and by means of the tube collapsing and the water bursting immediately into the fire, generate steam of an incalculable pressure, the sad effects of which I need not mention here. Various plans have been suggested in order to prevent explosions; some by giving a signal to the engine man when the water has become too low in the boiler; but a question arises whether or not the occasional defective state of these things, together with the reliance or dependence the engine man would place in them, would not be the cause of more explosions in a given time than there has been without them. The common guage cocks are sure indicators of the state of the water in the boiler; and if the engine man neglects these things I would not place much reliance on the safety of any other thing. Lead plugs have been applied immediately over the fire, the intention of which has been that if the engine man

should allow the water to get below the back of the fire place, the lead would melt, and thereby give him notice of danger; but this can be of little or no use, because it requires a temperature of 612° to melt the lead, which temperature will cause the iron to become so weak that steam of ordinary pressure will at least injure the boilers before it has attained the above heat. The present cylindrical boilers now in use in this county and in many other parts, are in my opinion the most economical generators of steam and the most safe that have been hitherto adopted; but it must be borne in mind that no boiler of whatever form can be safe without proper attention being paid by the engine man as to the water gauge, and by the engineers as to the pressure of steam used in proportion to the strength of boilers. And I would beg strongly to recommend, that with the strength of boilers at present in use in this county, steam of more than thirty-five pounds per square inch should not be used; and that proper apertures for the admission of steam on the piston, in proportion or suitable to that pressure should in all cases be used. I am fully satisfied that if this is properly attended to, we shall have no more violent explosions."

NATURAL HISTORY.

A few days ago, a log of St. John's yellow pine timber, cut up in the Greenock patent saw-mill, was found to contain a hive of bees, in a most perfect state of preservation. The log was a root-cut, 35 feet in length, and 26 inches square. It was about 140 years of age, as indicated by the annular fibres of the wood. The age of the tree at the period when the bees seem to have taken up their abode in it, must have been from thirty to forty years, as all the timber beyond that age was perfectly sound and without perforation. The insects were found in drouses of various sizes, all the way up from the bottom of the tree to near the upper end, and each drouse was connected with the other by a small aperture or passage, by which a connection was established between all the compartments of the hive. Bees in all stages of growth, and without any wings, were found in it, and the full-grown bees, in a state of perfect preservation, presented an appearance exactly similar to that of our own honey-bee after being destroyed by smoke. One of the cells filled with the bee still remains at the mill, for the inspection of the curious in natural history.

Glasgow Saturday Post.

This is not a solitary instance of bees being pent up in wood. Major Long relates a similar circumstance in Western America. Dr. White, formerly of Columbia College, found a bee embedded in the top of an old mahogany table, where it had undoubtedly been secreted during the growth of the tree.

Carnivorous Plants.—Of all the instances of sensibility in plants, the most remarkable is that of the Venus's Fly-trap. It has a large, dilated foot-stalk, and leaf formed of two lobes fixed by a middle rib, with

some thorny processes or protuberances, an arrangement to give it irritability. Nature provides a honey-like secretion, which attracts the flies and insects to feed upon, and by stepping on them the leaves close, and the insect is entrapped. Mr. Knight first ascertained that this plant could be fed on filaments of raw beef; but the general complaint is, that it will not live long enough in this country, from the want of a supply of its proper food. The lecturer was the first to discover that the sensibility resided in the thorns, and not in the middle rib, where it was formerly supposed to belong. After flies or any other insects are entrapped, the leaves remain closed several days, when the insect may be seen struggling within. The process will go on till both lobes of the leaf are collapsed and straight, and the teeth locked, until, at last, it will reöpen, when the insect will be seen crushed, every particle of fluid being absorbed, so that the fly may be blown out at almost the first breath of wind. There is another plant allied to it in geographical distribution, which, when kept in a green-house, entraps beetles, flies, and other insects. At the bottom of the flower is a saccharine liquid, to which the insect goes, but cannot return, as he is arrested by what are not inaptly compared to files of bayonets. The lecturer made a series of experiments on these plants, which had been in his possession for upwards of twelve years, by feeding them with filaments of beef and mutton, and they were at last destroyed merely by accident. Another plant, a native of our own country, the *droseua roturdifolia*, or sundew of our marshes, possesses apparatus of an analogous organic character, bearing a viscid fluid, and a multitude of hairs, which have the effect of catching insects whereon to feed the plant.

Professor Johnson's Lecture.

The common milk-weed and the *saracenia* have similar properties; but we are unwilling to carry our politeness so far as to believe the whole of the worthy professor's theory. There can be no doubt that the aqueous portions of the animal will be abstracted by the plant; but we also think that a piece of wet sponge would have been entrapped as readily as the beef, with full as great advantages to the plant.

Doryanthes Excelsa is one of the most conspicuous of the innumerable floral beauties which we owe even to the prolific flora of New South Wales. The stem rises eighteen or twenty feet from the centre of the plant, which is not unlike a large yucca or pine plant, and at the top there are several branches or stems, upon each of which expand a number of splendid crimson and pink flowers, somewhat like those of a canum, but infinitely richer in color. The specimen now blooming at Worton Lodge, Isleworth, is the first that has flowered in this country.

Glasgow Post.

It is a well known fact in natural history, that in large lakes and rivers, where swans abound, the parent birds, at the age of fifteen or eighteen months, drive off the large cygnets, and compel them to seek for new abodes. A beautiful pair of such youthful emigrants lately

established themselves on the splendid lake at Stamford Court, in Worcestershire, the seat of Sir Thomas Winnington, Bart. These birds appear about two years old, still retaining a portion of yellow down on the neck and body, and are so reconciled to the new situation they have chosen, that they approach the margin of the lake with much confidence and speed, on a signal from the gardener, who has received orders to feed and attend to them.

Glasgow Post.

Of every other tree connected with rural economy, perhaps the linden is the most valuable. In Russia, its properties are so well understood that it is seen growing in every hamlet and village possessing a soil capable of nourishing it. The wood is not only manufactured into furniture, but into a variety of domestic utensils. Cords and matting are made from its inner rind, while its aromatic blossoms not only perfume the air and feed the bees, but make an agreeable pisan for the invalid. The Circassians feed their bees on the blossoms, to produce the fine, green honey, aromatic in odor and delicious in flavor, esteemed so great a delicacy by the rich gourmands of Constantinople and Teheran. The young and tender sprigs, with their foliage, serve to mix with the fodder during the depth of winter, being highly palatable to the cattle. It is an ornamental tree, and may be seen adorning nearly every public garden and promenade in Germany.

Glasgow Saturday Post.

The effects of Food on the Form and Character of Quadrupeds.—Food influences all the external characters of quadrupeds. Without adverting to the different appearance of an ill-fed beast, and one which has an abundant supply, we may remark, that the form of the young animal that suffers a deprivation either in the quantity or quality of its food, never becomes perfectly developed, either in its bulk or proportions. The integuments of such an one never present the gloss of health, neither is the constitution at large often free from disease: internal congestions take place, and the mesenteric glands frequently become scirrhus: on the contrary, in proportion as the supply within prudent limits is liberal, so is the growth extended, and the form reaches to the standard of the parent. It often also exceeds the parent stock from the excess of nutritive stimulus applied; and thus horses, oxen, and sheep, brought up in low, marshy lands, where the herbage is luxuriant, obtain a monstrous size. Horses, in particular, when bred and pastured in the rich flatlands of Lincolnshire, become expanded in bulk; and it is from such sources that our carriage and heavy troop horses are supplied. To what a degree of monstrosity may not our bacon-hogs be fed! and our prize oxen exhibit the extraordinary powers of food, when forced on an animal, by increasing the supply and restraining the expenditure. It is from our artificial mode of feeding cattle that our markets are now furnished with veal all the year round, and lamb is common some months before it appeared on the tables of our forefathers. Stimulating food produces the sexual appetite at almost any time the owner may desire; and as man by domestication has provided artificial sustenance and housing for the young animals thus unseasonably produced, nature does not interfere in this breach of her ordinary laws.

Encyclopedia of Rural Sports.

DESCRIPTION OF PATENTS

Granted from April 24th to May 26th, 1840.

Improvement in machinery for the manufacture of Stuffs in which the Fibres of various materials are united with adhesive Mixtures. By THOMAS R. WILLIAMS, Cit. U. S. now in London, England. Dated April 24th, 1840.

CLAIM.—What I do claim as my invention, and desire to secure by letters patent, is the so combining and arranging the machinery employed substantially in the manner herein set forth, as that the processes of forming the bat, and of saturating the same with the different compounds, shall be simultaneously and consecutively effected, so as to form sheets or lengths of fibrous materials applicable to various purposes.

Improvement in the Machine for crushing hard Substances. By JAMES ROWE, Athens, Alabama. April 24th.

CLAIM.—That which I claim as my invention, and desire to secure by letters patent, is:—1. The mode herein described of preventing the grinding-wheels from slipping, by means of the cog-gearing or by cross projections and indentations in the bottom of the valley, together with cuts or notches on the tread of the grinding wheels.—2. The method of applying the weight of the centre revolving shaft, or any additional weight which may be applied thereto, to the grinding or crushing wheels, by making the shaft bear upon the vibrating beam to which the wheels are attached, as herein described.

Improvement in the mode of constructing the Power Loom, so as to adapt it to the weaving of Figured Counterpanes and other articles. By ERASTUS B. BIGELOW, Lancaster, Mass. April 24th.

CLAIM.—What I claim as constituting my invention, and desire to secure by letters patent, is:—1. The manner in which the picker staves are operated upon by a single treadle so as to act simultaneously, whereby two or more shuttles may be thrown successively from the same shuttle-box, if required, the apparatus therefor being constructed substantially as set forth.—2. I claim the raising of the shuttle-boxes by the action of a spring or springs, weight or weights, and the allowing them to descend by their own gravity, when the tension of the spring or force of the weight is taken off, the same being effected in the manner described, or in any other analogous thereto.—3. I claim the relieving of the shuttle from the picker, by means of an apparatus constructed and operating as herein set forth; that is to say, by the combined action of the levers U, the pieces V, and the rods A, connected and operating substantially as described.

Improvement in the manner of constructing Bedsteads, and cording the same. By MARTIN ENGEL, Easton, Pa. April 24th.

CLAIM.—What I claim as constituting my invention, and which I desire to secure by letters patent, is the manner of connecting the posts and rails together, by causing the pins on the ends of the tenons of the side-rails to enter holes prepared to receive them in the tenons of the head-rails, as herein set forth.

I also claim the manner in which I have combined and connected the windlass, the roller E and F, and the cord upon which they operate, for the purpose of tightening the same, and of straining the side-rails and posts together; the whole operating substantially in the manner described.

Improvement in metallic Heddles for Looms. By CHARLES STRONG, Hartford, Vt. April 24th, antedated Jan. 21st, 1840.

CLAIM.—I do not claim to have invented the metallic heddle, but I claim to have made improvements upon it. What I claim is:—1. That I have invented the method of constructing the eyelet holes in the common and listing heddles, as above specified.—2. I claim to have invented the method of arranging the metallic heddles in two rows instead of one, by which arrangement higher sleyed cloths may be woven by the metallic heddles than without that arrangement, as above specified and described.

Improvement in Machinery for making Rivets. By OLIVER EDES and ANDREW HOLMES, Braintree, Mass. April 24th.

CLAIM.—1. We claim a lever or beam H I J, (to which the cutter *ik* is attached) operated on or pressed downwards by the cam G on a horizontal shaft B B, in combination with the steel block *fg*, and standard or guage U, the whole operating to cut off and regulate the length of the piece of wire to be formed into a rivet.—2. We claim the combination of the cutter *ik*, and arm V, for pinching or nipping the piece of wire separated by the cutters, and conveying it downwards (by descent of the cutter *ik*) to the aperture *qr*, to be headed by the heading machinery; and we claim that combination and arrangement of the parts for withdrawing the arm V from under the head of the rivet in the aperture *qr*; the said combination and arrangement consisting of the bent lever X Y Z, the standard *lm*, spring *op*, connected to the shelf or arm V, and operated by a stud or projection W from the heading carriage, substantially in manner above described.—3. We claim the combination of machinery, (consisting of an upright lever M, bar *az*, lever *wxy*, and piston *uv*, operated by a crank *k* on the main shaft B B and connecting rod L,) for forcing or pushing out the rivet from the aperture *qr*, after the heading machinery has performed its office.

Moveable Loading Muzzle for Rifles. By ALVAN CLARK, Cambridge, Mass. April 24th.

CLAIM.—I claim as my invention, and ask a patent for the loading muzzle for the rifle above described, constructed, adapted, fitted, and applied as above described.

Improvement in the machine for braiding Manilla Hemp and other Fibrous Substances. By DANIEL, JESSE, and ELISHA FITZGERALD, New-York. April 24th.

CLAIM.—What we claim as our invention, and desire to secure by letters patent, is:—1. The combination of the pressing-rollers M and N, with spool-guides Q, and eye-plate, as herein described.—2. The employment of the guide Q, Pl. 1, in the manner and for the purposes described.

Improvement in Corn Shellers. By PORTER A. GLADWIN, Chester, Middlesex County, Connecticut. April 24.

CLAIM.—What I claim as my invention, and desire to secure by letters patent, is the forming of the concave with a number of shelling rollers arranged in the manner herein set forth. Also, the arranging of the spring beds in the carrying cylinder instead of the concave as herein described.

Improved method of constructing the Boilers of Steam Engines. By JOHN PENNIMAN, Baltimore, Maryland. April 24.

CLAIM.—What I claim therein as my invention, and desire to secure by letters patent, is the placing a series of circulating tubes on the front plate of the boiler, in such a manner as that they shall at their lower ends communicate with the water in the lower part of the boiler, and at their upper ends with the water in said boiler a little below the water line, whilst they are along their whole length, exposed to their direct action of the heat in the fire box, in the manner and for the purpose above set forth.

Improvement in Smut Machines. By JACOB RUSSELL, Jenner, Somerset County, Pa. April 24.

CLAIM.—What I do claim, is the arranging them in a case formed with a double concave, so that each series of fans or beaters shall revolve in a separate concave, as herein described.

Improvement in the duplex escapement in Watches. By C. E. JACOB DES COMBES, Baltimore, Md. April 30.

CLAIM.—What I claim as my invention, and desire to secure by letters patent, consists in constructing the escapement wheel R, with bifurcated teeth, so that in operating on the rouleau placed on the pivot of the balance wheel a greater number of vibrations may be produced than in ordinary duplex watches; and in making it without the pinion hitherto placed on its axis, (which in my arrangement is transferred to the wheel G,) by means of which improved construction of the escapement wheel, its pressure on the rouleau is lessened, as above described. I also claim the combining therewith the wheel G, with its pinion G', for the purpose, and in the manner set forth.

In the second part I claim the manner of combining and arranging the double hands, the barrel D, the ratchet spring *r*, and the ratchet wheel, to be operated upon by means of the ring and catch, in the manner and for the purpose described.

Improvement in the construction of drums for heating apartments. By WILLIAM FRAZIER, Brooklyn, New-York. April 30.

CLAIM.—What I claim as my invention, and desire to secure by letters patent, is the partitions K, and the pipes I, combined in the drum B, as above described.

Improvement in the apparatus for the treatment of Club Feet. By JOHN B. BROWN, Boston, Suffolk County, Mass. April 30.

CLAIM.—1st. I claim constructing the foot board A, fig. 1, of two parts, B and C, and connecting the same by a radial bar C, turning on a centre pin *e*, figs. 1 and 2, so that by means of a toothed sector *d*, figs.

1 and 2, on said radial bar *c*, and an endless screw *f*, working in the teeth of said sector. The anterior part *C*, and heel *B*, on application of a turning key on the shank *g* of the endless screw *f*, may be set in angular positions with each other, so as to adapt the same to the angle of deformity of the "club foot," and afterwards used to correct the said deformity in manner as herein before described.

2d. I claim connecting the anterior parts and heels by the yokes *a b*, *c d*, attached to ears *e, f, g, h*, fig. 3, and *e', g'*, fig. 1, projecting therefrom; the former of said yokes being somewhat longer than the latter, thereby turning the feet outwards until the divided tendons are united, and the bones acquire the relative and normal position.

Improvement in the mode of feeding and pressing the Straw in Straw-Cutting Machines. By ISRAEL W. GROFF, Lampeter, Lancaster county, Pa. April 30th.

CLAIM.—What I claim as my invention, and desire to secure by letters patent, is the combination of the bearer and rack-wheel, constructed and operating as herein set forth; that is, worked by the dogs in such a manner as to change the pressure alternately from the bearer to the feeder, which effect is produced by the manner in which the dogs are worked by the cams, the feeding by this operation being made thicker or thinner, and the stuff cut short or long, at pleasure.

Instrument for adjusting the Grinding Surface of Artificial Teeth. By JAMES CAMERON, Philadelphia. April 30th.

CLAIM.—What I claim as my invention, and desire to secure by letters patent, is the combination of the plates *A* and *B*, with the stand *C*, the whole being constructed and operating substantially as described or set forth. I claim also, in combination with the foregoing arrangement, the rod *O*, and shaft *M*, for supporting the lower plate when in use. Lastly, I claim the mode of regulating the motion of the lower plate by means of the combined operation of the hinge *I*, screw *J*, and screw *K*, attached to the horizontal rod *F*, as herein set forth.

Improvement in the Machine for picking and opening Wool, Cotton, and other fibrous substances. By GEORGE C. KELLOGG and PHINEAS GILLET, New Hartford, Litchfield county, Conn. April 30, 1840, antedated Oct. 30, 1839.

CLAIM.—What we claim as our invention, and desire to secure by letters patent, is the combination of the feeder and shell, and also their combination with the picker and cylinder as described.

We also claim the method of holding and setting the teeth in the lags, by means of the screw-staples or bolts as described.

Improvement in the process of Tanning. By R. T. DOWNING and GEO. D. SMITH, Philadelphia. April 30th.

CLAIM.—What we claim as our invention or discovery, is an improvement in the art or process of tanning, by cleansing the hides whilst suspended in bark or other liquor containing the tannin principle, by means of a brush with a long handle, made and used as above set forth, in order to prevent the collection of any sediment, dirt or impurity upon the surface or grain of the leather, and thus to allow the liquor to act,

producing gradually, from commencement of the process, the desirable color or bloom, and giving the tannin a free access through the pores to unite with the gelatine of the hide.

Improvement in Seed-Planters. By LORENZO and SAMUEL H. BACHELDER, Hampsted, N. H. and Haverhill, Mass. April 30th.

CLAIM.—We claim the combination of the coulter C, with the plough-share D D, chisel-shaped projection or nose E, and crop-sill $d\ d$; said combination being substantially in the manner and for the several purposes herein above described. We also claim the combination of the dropping-tube or conducting-pipe $a\ a$ with the above specified parts, for securing the effects herein above specified.

Improvement in Fire-Places to prevent their Smoking. By HOMER ROBERTS, Delhi, Delaware county, N. Y. April 30th.

CLAIM.—What I claim as my invention, and desire to secure by letters patent, consists in the before described mode of arranging the cast and wrought iron straight and curved plates in the chimney, forming curved flues, for curing and preventing chimneys from smoking, and forming openings for the convenience of removing the soot, and for obtaining an easy admission into the chimney from the fire-place, as herein set forth.

Improvement in the machine for extracting Stumps. By FREDERICK A. STEWART, of Catharine, New-York. April 30.

What I claim as my invention, and which I desire to secure by letters patent, is the construction of the lever as before described, so that the angle formed by the inclination of the lever, and the chain attached to the stump can be decreased at pleasure, independent of the size of the stump, which is not the case with "Foster's."

Improvement in the machine for preparing and spinning Hemp, &c. By MOSES DAY, Roxbury, Mass. April 30.

1st. I claim the combination of the revolving drums and several rows of teeth with the machinery within said drums for operating the several series of teeth or metallic points; the whole of the above specified machinery being constructed and operating substantially in the manner and on the principles herein above set forth.

2. I claim the regulator m , constructed substantially as herein before described and also the combination of the same with the several different series of teeth formed as described, (those near the sides of the drums being shorter than those near the centre of the same,) which arrangement in conjunction with the peculiar shape of the regulator forms the roving from which the thread or yarn is to be made.

3. I claim stopping the motion of the preparative part of the machinery by means of the regulator m , in combination with the rod q^2 , shaft r^3 , the bent lever ℓ^3 on the said shaft, bent lever w^3 , and clutch y^3 on the shaft P P, as herein described.

4. I claim the employment of a single threaded screw g^2 on the spindle, and its combinations with the fork e^2 , (attached to the side of the series of pulleys a^2 , n^2), belt z^1 , pulley w^1 , and drum y^1 , the whole constructed and operating substantially as above described, for the purpose of imparting a reciprocating rectilinear motion to the spindle and bobbin.

Improvement in the mode of stiffening Rocket Staffs. By JOHN W. COCHRAN, New-York. April 30.

CLAIM.—What I claim as my invention, and desire to secure by letters patent, is the method herein described of stiffening rocket staffs by means of metallic stiffeners in the form of metallic cylindrical tubes, or with a cylindrical metallic tube, having flanches, or with the metallic flanches above, as herein described, or in any other way that shall be substantially the same.

Method of taking Likenesses, by means of a concave reflector, and plates so prepared, as that luminous or other rays will act thereon. By ALEXANDER S. WOLCOTT, New-York. May 8.

CLAIM.—I claim as my invention, and desire to secure by letters patent, the taking of likenesses from life by the aid of a concave reflector, placed so as to receive the rays from the person whose likeness is to be taken, and convey them to a focus on a prepared plate, paper, or other material, placed between the person and the reflector.

Improvements in the construction of the Stop Cock. By JAMES ROBERTSON, New-York. May 8.

CLAIM.—What I claim as my invention, and desire to secure by letters patent, is making the valve A fit more firmly in its seat by means of the independent wedge, constructed and operating as above described. 2d. I claim the mode of cleansing the chamber S from any dirt that may accumulate in it, by means of the escape valve H, arranged and operating as above set forth.

Improvements in the construction of the Tailors' Measure. By RICHARD DAME HANSON, Grafton County, New Hampshire.

CLAIM.—What I claim, therefore, as constituting my invention and improvement, is the attaching the additional or extension branch at the end of the ordinary horizontal branch B, of the tailors' measuring square, by means of the hinge H, and combining with the branches the sliding hinges for attaching said branches, as set forth.

Improvement in Metallic Wigs. By F. BOURGUET, New-York. May 8.

CLAIM.—What I claim as my invention, and desire to secure by letters patent, is the construction of the metallic wig, with an additional transverse piece or spring C', C, C'', tempered soft and flexible, so that it may be bent to any degree the wearer pleases, and of sufficient thickness to control the elastic spring B', B, B'', and keep it in the position to which it has been bent.

I also claim in combination with the above, the arch spring A, B, C, D, E, and oblique spring D', D'', and D, D'', the whole being constructed and operating as herein set forth.

Improvement in Horse Power for driving Machinery. By GEORGE STRENGE and JACOB ROHRER, Lancaster, Pa. May 8.

CLAIM.—What we claim herein as of our invention, and desire to secure by letters patent, is the allowing of a vertical play to the sweeps or levers, by causing springs to act upon their upper and lower sides, in the manner and for the purpose set forth.

Improvement in the Railroad Car Brake, to prevent accidents in descending Inclined Planes on Railroads. By MATTHEW W. KING, New-York. May 8th.

CLAIM.—What I claim as my invention, and desire to secure by letters patent, is the compound lever brake, combined and arranged as herein described.

Improved Composition for writing on Glass. By WILLIAM DAVISON, New-York. May 8th.

CLAIM.—What I claim as my invention, and which I desire to secure by letters patent, is the method of preparing the surface of the glass, under which the copy to be imitated is placed and on which the writing is performed, by rubbing it with a cake composed of hard soap and English scouring-sand, as before described.

Improvement in Tub Water-Wheels. By ABIJAH WOODARD, Athol, Worcester county, Mass. May 8th.

CLAIM.—What I claim herein as constituting my invention, and desire to secure by letters patent, is the enlarging of the lower end of the shaft of such a wheel, by surrounding the same with a drum, upon which drum I place two rows of buckets in addition to and in combination with the row of buckets used in the ordinary tub-wheel, the whole being constructed and operating substantially as herein set forth.

Improvement for shaking the Screen or Apron in Threshing-Machines, that carries the Straw from the Threshing Cylinders. By JESSE LINCOLN, Uniontown, Fayette county, Penn. May 8th.

CLAIM.—What I claim as my invention, and desire to secure by letters patent, consists in the combination of the flat roller with the revolving screen, as before described.

Improvement in the Dredging-Machine, for excavating under Water in Rivers, Docks, &c. By OLIVER ALLEN, Norwich, New London county, Conn. May 8th.

CLAIM.—What I claim as my invention, and desire to secure by letters patent, is the manner in which I govern and direct the operation of the excavating bucket F, by the combined operation of the lever E E, and the rope or line I I, arranged and operating substantially in the manner and for the purpose herein set forth.

Improvement in the manner of constructing Winnowing-Machines. By ABEL and ASAHIEL LOMAX, Clinton county, Ohio. May 8th.

CLAIM.—The parts of the herein described machine which we claim as our invention, and for which we wish to secure letters patent, are specified as follows :

1. We claim the adapting of one end of the cylinder to the shoe, and this having the air to pass from its end directly into the shoe.
2. We claim the mode of arranging the shoe by which we are enabled to communicate a greater motion to the upper than the lower part of it.

Improvement in the manner of constructing Garden Hoes. By CHARLES S. HOMER, Boston, Mass. May 8th.

CLAIM.—What I claim is the mode herein described of connecting the hoe-plate and shank, by forming the latter with a square head, and riveting it to the outside of the blade, the shank having been passed through it, and passing an iron collar over the shank on the inside of the hoe-plate, in the manner herein described, so as to confine the plate between said collar and the square head on the outside of it; by means of which arrangement I am enabled to give not only greater strength to the blade of the hoe, but to make the instrument more durable than hitherto constructed.

Improvement in the manner of constructing Railroads. By WILLIAM RUSSELL, New-York. May 8th.

CLAIM.—What I claim therein as constituting my invention, and desire to secure by letters patent, is the manner of forming the track or road by the combination of the string-pieces with sloping sides, and the wooden blocks cut from scantling adapted to the said sloping sides, and resting on a foundation of boards or plank, the whole arranged and constructed substantially as set forth.

Improvement in the Life-Preserver. By RALPH BULKLEY, New-York. May 8th.

CLAIM.—What I claim as my invention, and desire to secure by letters patent, is the combination of the air-tight tubes with the belt, in the manner and for the purpose described.

Improvement in the Life-Preserver. By HENRY B. BOURNE, New-York. May 8th.

CLAIM.—What I claim as my invention, and desire to secure by letters patent, is the method of adapting the common berth mattress to a life and property preserver, by making a water-tight chamber, provided with leggins between the two halves of the mattress, for the purpose and in the manner described. I also claim the making a portion of each half of the mattress buoyant, for the purpose and in the manner described.

Improved self-acting Sparger, for distributing Water upon Malt in the Mash-Tub. By H. J. BROOKE and F. B. LONGMIRE, Philadelphia. May 8th.

CLAIM.—We claim as our invention, and desire to secure by letters patent, the manner in which we have applied this principle, by combining a reacting apparatus with the mashing-tub; the whole being constructed in the manner and for the purpose herein described and set forth.

Improvement in the method of stopping accidental breaches in Fire-Hose. By RALPH BULKLEY. May 8th.

CLAIM.—What I claim as my invention, and desire to secure by letters patent, is the mode of repairing lateral breaches in hose by

means of screws, as herein set forth. Also, of repairing larger breaches in the same, by means of metallic plates and inflexible tubes inserted in hose, constructed and secured in the manner herein described.

Improvement in the construction of Fire Escapes. By WILLIAM P. WITHEY, Hartford, Ct. May 12.

CLAIM.—What I claim as my invention, and desire to secure by letters patent, is the bringing of the railed platform to the top of the ladder, and rendering it capable of being adjusted to a horizontal position, whatever may be the inclination of the ladder, by means of the toothed segments *o, o*, the whole being constructed and operating substantially in the manner herein set forth.

Improvement in Hulling Machines. By JAMES MCGREGOR, Saratoga, New-York. May 12.

CLAIM.—What I claim as my invention, and desire to secure by letters patent, in the above described machine, is the manner in which I have combined and arranged the revolving disk and the hollow drum or cylinder, with flights or projecting pieces thereon, affixed in such a way as to carry the grain or seed, under considerable pressure, towards the periphery on the upper side, and towards the centre on the under side of the revolving disk. I also claim in combination therewith, the valve bearing against the delivery opening, for the purpose of increasing the pressure to any desired extent.

Improvement in the construction of the Franklin Cooking Stove, and causing the jambs to rise or fall through the apron. By JOEL HOUGHTON OGDEN, New-York. May 12.

CLAIM.—What I claim as my invention, and which I desire to secure by letters patent, is making the jambs of the stove or Franklin to lower through the apron of the same, so as to bring the boiler holes that are above the jambs immediately over the fire, the whole being constructed and operating as herein set forth.

Improvement in the construction of machinery for Hulling Rice, &c. By DANIEL TOMLINSON, Brookfield, Conn.—May 12.

CLAIM.—What I claim as my invention, and wish to secure by letters patent, is the before described mode of producing any desirable amount of pressure on the materials to be hulled or cleaned, and continuing the same through the whole length of the cylinder, by the combined operation of the oblique teeth, the round teeth, and the sliding gate or issue, effected continually during the operation of the machine.

Improvement in Bedstead Fastenings. By WILLIAM H. SABIN, New Milford, Pa. May 12.

CLAIM.—What I do claim is my improved mode of forming and affixing them by a cylindrical ferule or segment to the posts, and by a ferule to the rails, the end of which ferule is hollowed to adapt it to the post, the whole being combined and arranged as above described.

Improvement in the Sofa which can be adapted to invalids. By MARTIN ENGEL, Easton, Pa. May 12.

CLAIM.—What I do claim as constituting my invention, and desire to secure by letters patent, is the peculiar and novel manner in which these objects are effected by me, so as to render it more manageable and convenient than those heretofore constructed.

That is to say, I claim the manner in which I have combined the windlass with the raising frame and the jointed arm in the head part A, not intending to claim either of those parts separately but only in their entire combination as herein set forth; I in like manner, claim the combination of the respective parts which constitute the lowering and elevating portions of the foot end divided into two parts width-wise, and connected and operating as a whole in the manner set forth.

Improvement in the mode of making and affixing the Ears and Bails of Pails, Buckets, &c. By JOHN F. PHELPS, Havana, New-York. May 12.

CLAIM.—What I claim as my invention, and desire to secure by letters patent, is the so constructing and affixing the ears and bails of buckets or other vessels of wood, or of metal, as that the hooks of the bails bent inwards shall be received and turn within a cavity, prepared to receive them on the under sides of the ears, as herein described, the latter being attached so as to stand below the rims of the vessels to which they are affixed. I do not claim the mere turning of the hooks inwards, this having been before done, but I claim only the combination of the hooks and ears as above set forth.

Improvement in the construction of Dry Docks. By JOHN S. GILBERT, New-York, May 12.

CLAIM.—What I claim therein as of my own invention, and desire to secure by letters patent, is, 1. The particular manner of arranging the cross timbers by placing a part below and a part above the caulked bottom, thereby securing said *caulked bottom between clamps*, for the purpose of preventing the opening and shutting of said caulked seams, &c. 2. The employment of a hydrostatic water stopper, for the purposes and in the manner heretofore described in this specification.

Improvement in the mode of preventing explosions in Steam Boilers. JAMES REID, Pawtucket, R. I. (An alien who has resided in the United States one year next preceding his application.) May 19.

CLAIM.—I claim as my invention, *first*, the coiled or otherwise properly shaped tube or vessel P, Q, R, chamber C, tube B, cylinders A, and float G, in combination with the safety valve, the whole operating together by the surcharged steam acting on and expanding the water or gas in the tube P, Q, R, thereby forcing the column of mercury to rise into the chamber A, and lift the float G, and lever M, N, of the safety valve thereto connected, thus allowing the escape of steam whenever at such times an accumulation of superabundance of heat therein may be dangerous or tend to produce an explosion of the generator.

Improvement in Machines for Cleaning Grain. By SAMUEL SPANGLER, Stony Creek, Pa. May 19th.

CLAIM.—What I claim as my invention, and desire to secure by letters patent, consists in the before described fans, arranged one over the other, in a perforated case, so that they shall act both as beaters and fans, as herein set forth, in combination with the fan I, in the enlarged part of the case.

Improvement in the Floating Dry Dock. Patented to James Peck, Robert Wash, William Thomas, and John D. Coulter, on the 26th of March, 1834. By WILLIAM THOMAS, St. Louis, Missouri. May 19th, 1840.

CLAIM.—What I claim as my invention, and desire to secure by letters patent, is the employment of the *ballast cistern* in combination with the floats, in the manner herein described.

I also claim the making of the *bulk heads*, which separate the chambers, *water-tight*, so as to prevent the water from passing from one chamber to another, except through the pipes governed by cocks, as herein described. I also claim the mode of connecting the several chambers and the wells by means of water and air pipes, governed by cocks, valves, or gates for the purpose, and in the manner described.

Improvement in Pumps. By LEBBEUS CASWELL, Harrison, Cumberland county, Me. May 19th.

CLAIM.—What I claim as my invention, and desire to secure by letters patent, is the constructing of one or more slits in the lower part of the tube or bore of the pump as described, and connecting the piston rod with the moveable piston by passing it through the same, as herein set forth.

Improvement in Rifles and other Fire-Arms. By JAMES R. THOMAS, Collinsworth, Talbot county, Ga. May 19th.

CLAIM.—I do not make claim to either of these parts taken individually; but I do claim the manner in which I have combined them with each other so as to coöperate together, substantially in the manner and for the purpose set forth.

Improvement in Bee-Hives. By ROBERT MARTIN, Fairfield, Columbiana county, Ohio. May 19th.

CLAIM.—What I claim as my own invention, and desire to secure by letters patent, is the mode of removing the dirt from the top to the bottom of the house by means of the apertures in the floors and drawers, combined so as to form a passage from the top to the bottom of the hives; the whole being constructed as set forth in my specification.

Improvement in Threshing-Machines. By DAVID STAFFORD, Syracuse, Onondaga county, N. Y. May 19th.

CLAIM.—What I claim as my invention and improvement, and desire to secure by letters patent, is the manner of constructing the feeding-

table or drop-apron, with one section to drop with the hinge or pivot, and with the springs or other means underneath to sustain the same, as above described, and the object of which is to prevent injury and fracture to the machine in the manner before described. The same principle is applicable to all other machines for a like or similar purpose, and my claim is not confined to machines of the peculiar construction of that above described and specified.

Improvement in the mode of applying Water to propel Machinery. By WILLIAM BAKER, Utica, N. Y. May 19th.

CLAIM.—What I claim as my invention, and desire to secure by letters patent, is the method herein described of applying the atmospheric pressure to propel a revolving engine or machine, by placing a conductor for the passage of the water below such engine or machine, by the descent of the water in which conductor a pressure of atmosphere is brought to bear on the engine or machine, corresponding to the height of the column of water below it. I also claim the combination of the revolving cylinders, and the enclosure in which they are placed, with the conductor below said engine: the whole being constructed, arranged and operating substantially in the manner herein set forth.

Improvement in Pumps. By JOSEPH EVANS, Lebanon, Warren county, Ohio. May 25th.

CLAIM.—What I claim therein as constituting my invention, and design to secure by letters patent, is the manner in which I have combined and connected the copper tube forming the chamber of my pump with the lower box or valve, and seat thereof, as described, and for the purpose set forth. I also claim the manner in which I have constructed the upper box, or valve and seat, as described; that is to say, the causing the leather disk which constitutes the valve, not only to operate as a valve, but also as a packing to the piston, substantially as set forth.

Improvement in the Machine for Washing Clothes. By SEWALL BENSON, Waterville, Kennebec county, Me. May 25th.

CLAIM.—What I claim therein as constituting my improvements, and desire to secure by letters patent, are the following particulars:—1st. The manner in which I have arranged and combined the rollers on semicircular arms, vibrating on their centres upon vibrating arms, and regulated in their action by the lever M borne up by means of a weight, as above set forth.—2d. The combination of the rollers attached to the semicircular arms, with the vibrating frame and fluted wash-board. In making the foregoing claims, I do not intend by the terms employed to limit myself to the precise form and particular construction by me set forth, as these may be departed from without substantially altering the nature and operation of the machine: the semicircular arms, for example, may be replaced by arms not semicircular; the weight for making pressure against the rollers may be substituted by a spring; and other changes of a like nature may be made, and yet the essential characteristics of my machine might still remain, as every competent machinist is well aware.

Improvement in the Seed-Planting Machine. By GEORGE PAGE, Baltimore, Md. May 25th.

CLAIM.—What I claim therein as constituting my invention, and desire to secure by letters patent, is the manner of combining the hopper and the receptacle with the sliding shutter, so as to govern the level of the seed in said receptacle, and thus to regulate the feed in combination with the elevating belt D, in the manner set forth. I claim also the attaching of a separate marking wheel K, in the manner and for the purpose above expressed.

Improvement in the construction of Metallic Sleigh-Runners. By ARUNAH SPEAR, Braintree, Orange county, Vt. May 25th.

CLAIM.—What I claim as my invention, and desire to secure by letters patent, is the construction of the runners of a sleigh, of iron or other metal, in the manner above set forth, so as to cause the strain arising from a pressure on one side of the runner, and a pulling on the other in a manner tending to break the same, to act mainly on the edge of a thin piece of iron or other metal, thereby avoiding an inconvenient weight and preventing the centre from operating as a fulcrum over which to break the sides of the runner, nave, or panel.

Improvement in the Life-Preserver or Buoyant Dress. By RUFUS PORTER, Billerica, Middlesex county, Mass. May 25th.

CLAIM.—What I claim as my invention, and desire to secure by letters patent, is making the buoyant circle in several separate, air-tight chambers, each provided with a tube for inflating, as described. I also claim the circular fins or paddles in combination with the water-proof garment, as described.

Improvement in the Clasps of Carpet-Bags. By JAMES SELLERS and A. L. PENNOCK, Philadelphia. May 25th.

CLAIM.—What we claim as our invention, and desire to secure by letters patent, is the construction of a clasp composed entirely of wood, and the adapting the same to and combining it with bags for the conveyance of letters, traveling bags, or valises, and such others to which it may be adapted; the said clasps being connected together by hinges of metal, by links, or by any flexible material which may be preferred.

Improvement in the construction of Cooking Stoves. By WM. JEANES, Philadelphia. May 25th.

CLAIM.—What I claim as my invention, and desire to secure by letters patent, is the particular manner in which I have constructed, arranged and governed the passages for the draught from the fire, as above described: that is to say, the manner in which I have divided the box or body containing the oven into two chambers or compartments, by means of the partition G G, cutting off all communication between said compartments excepting through the opening F, or through the columns D D, said box being connected with the base by their means; the whole structure being combined, arranged, and operating substantially in the manner and for the purpose herein set forth.

LIST OF ENGLISH PATENTS

Granted between the 28th February and the 27th March, 1840.

James Beaumont Neilson, of Glasgow, gentleman, for certain improved methods of coating iron under various circumstances, to prevent oxidation or corrosion, and for other purposes. Patent dated Feb. 29; six months to specify.

Rowland Macdonald Stephenson, of Upper Thames street, civil engineer, for an improved method, or methods of adjusting, shifting, and working theatrical scenery and apparatus. Feb. 29; six months.

Richard Edwards of Fairfield place, Bow, dealer in emery cloth, for improvements in preparing and combining of materials used in lighting or kindling fires. Feb. 29; six months.

John Sylvester, of Great Russell street, engineer, for improvements in the construction of doors and frames, for closing the openings of fire places, ash pits, flues, chimneys, and certain retorts. March 3; six months.

Joseph Shore, of Birmingham, merchant for improvement in preserving and covering certain metals and alloys of metals. March 3; six months.

James Horne, Clapman Common, Esq. for improvements in the stuffing boxes of lift pumps. March 3; six months.

Joseph Clisild Daniell, of Limpley Stoke, Wilts, for an improved method of preparing shoot or weft to be used in weaving woollen cloth, and cloths made of wool and other materials. March 3; six months.

John Rangeley, of Camberwell, gent. for improvements in the construction of railways, and in the means of applying power to propelling carriages and machinery. March 3; six months.

William Craig, of Glasgow, engineer, and William Douglass Sharp, of Stanley, Perthshire, engineer, for certain improvements in machinery for preparing, spinning, and doubling cotton, flax, wool, and other fibrous substances. March 3; six months.

Joseph Norton, of High Bridge Mill, York, manufacturer of fancy cloths, and George Collier, of the same place, mechanic, for an improvement in looms for the weaving of figured and twilled fabrics. March 4; six months.

Joseph Bower, of Hunslet, Leeds, soda ash manufacturer, for certain improvements in the manufacture of carbonate of soda. March 4; six months.

Charles Alexander Petterin, of Leicester square, gent. for improve-

ments in wind and stringed musical instruments. (A communication from a foreigner.) March 4; six months.

Charles Kober, of Leadenhall street, manufacturer, for improvements in fixing color in cloth. March 7; six months.

Caroline Julia Sophia Cox, of Addison Road, Kensington, spinster, for an improved mode of fastening and uniting the edges of the divided parts of shoes, boots, bandages, packages, and other articles of dress and utility. March 7; two months.

Joseph Atkinson, of Round Mill, York, farmer, for improvements in thrashing and winnowing machines. March 7; six months.

Robert Molyneux, of Southampton Row, chronometer maker, for an improvement, or improvements in chronometers. March 7; six months.

William Maltby, Jr. of Mile End, chemist, and Richard Cuerton, Jr. of Percy street, brass founder, for improvements in extracting and concentrating the color, tanin, and other matter contained in vegetable and animal substances. March 7; six months.

Luke Hebert, of Birmingham, C. E., for improvements in the manufacture of cofered spades and shovels, soughing and grafting tools, and other implements of a like nature. March 7; six months.

Hayward Tyler, of Milton street, Cripplegate, engineer, for certain improvements in machinery, or apparatus for impregnating liquids with gas, including bottles for retaining, keeping, and preserving liquids so impregnated; also in the manner of filling and closing such bottles. March 7; six months.

James Knowles, of Little Bolton, Lancaster, coal merchant, for an improved arrangement of apparatus for regulating the supply of water to steam boilers. March 10; four months.

George Gwynne, of Portland Terrace, Regent's Park, gent. for improvements in the manufacture of candles, and in operating upon oils and fats. March 10; six months.

Wm. Forrester, of Barrhead, Renfrew, manager, for certain improvements in sizing, starching, dressing, and otherwise preparing warps, for weaving fabrics, and on the machinery and apparatus therewith connected. March 11; six months.

Thomas Peet, of Bread street, Cheapside, gent. for certain improvements in steam engines. (A communication from a foreigner.) March 11; six months.

Richard Smith and Richard Hacking, both of Bury, Lancaster, machine makers, for certain improvements in machinery, or apparatus for drawing, slubbing, roving and spinning cotton, wool, flax, silk, and other fibrous substances. March 13; six months.

Etienne Robert Gaubert, of Paris, professor of mathematics, for certain improvements in machinery or apparatus for distributing types or other typographical characters into proper receptacles, and placing

the same in order for setting up after being used in printing. March 13 ; six months.

James Hadden Young, of Little France, merchant, and Adrien Delcombe, of the same place, manufacturer, for an improved mode of setting up printing types. March 13 ; six months.

Robert Haricas, of Burton Crescent, surgeon, for improvements in rendering fabrics and leather waterproof. March 16 ; six months.

William Crofts, of Radford, Nottingham, machine maker, for improvements in machinery for the purpose of making figured or ornamental bobbin net, or twist lace, and other ornamented fabrics, looped or woven. March 16 ; six months.

Jean Francois Victor Fabien, of King William street, city, for improvements in rotary engines to be worked by steam or other fluids. March 16 ; six months.

Thomas Craddock, of Broaheath, Radnor, farmer, for a certain improvement or improvements in steam engines and steam boilers. March 16 ; six months.

Richard Smith and Richard Hacking, of Bury, Lancaster, machine makers, for certain improvements in machinery for spinning cotton and other fibrous substances. March 16 ; six months.

Isham Baggs, of Cheltenham, gentleman, for improvements in engraving, which improvements are applicable to lithography. March 17 ; six months.

Moses Poole, of Lincoln's Inn, gentleman, for improvements in producing and preparing lays for soap making, and in the manufacture of soap. (A communication from a foreigner.) March 17 ; six months.

Samuel Seaward, of the Canal Iron Works, Poplar, engineer, for certain improvements in the construction of steam engines, and in the application of steam engines to propelling ships and other vessels. March 17 ; six months.

Sir William Burnet, of Somerset House, Middlesex, knight, for improvements in preserving animal, woolen, and other fibrous substances from decay. March 19 ; six months.

John Jackson of Manchester, nail and bolt manufacturer, for certain improvements in the manufacture of nails, nuts, bolts, and rivets. March 19 ; six months.

Thomas Stirling, of Limehouse, patentee of the Rapid Filterer, for improvements in the manufacture of fuel. March 20 ; six months.

Francis William Gerish, of East road, City road, patent hinge maker, for improvements in locks and keys, and in other fastenings for doors, drawers, and other such purposes. March 20 ; six months.

Charles Keene, of Sussex place, Regent's park, gentleman, for improvements in producing surfaces on leather and fabrics. (A communication from a foreigner.) March 23 ; six months.

William Newton, of Chancery lane, civil engineer, for certain improvements in the strengthening and preserving of ligneous and textile substances. (A communication from a foreigner.) March 23; six months.

Samuel Hill, of Sloane street, Chelsea, gent. for improvement in the making of bread and biscuit. March 25; six months.

Elhanan Bicknell, of Newington Butts, merchant, for improvements in separating the solid from the liquid parts of tallow, and other fatty matters. (A communication from a foreigner.) March 25; six months.

William Palmer, of Sutton street, Clerkenwell, candle maker, for improvements in the manufacture of candles, and in apparatus for applying light. March 25; six months.

Henry Smith, of Birmingham, lamp manufacturer, for improvements in gas burners, and in lamps. March 25; six months.

George Richards Elkington, and Henry Elkington, of Birmingham, for improvements in coating, covering, or plating certain metals. March 25; six months.

Joseph Crossfield, of Warrington, soap maker, for certain improvements in the manufacture of plate glass. March 25; six months.

Samuel Knight, of Woodhouse, Lancaster, bleacher, for certain improvements in machinery or apparatus for boiling, bucking, or scouring, for the purpose of preparing and assisting the process of bleaching and dyeing cotton, and linen, and other fabrics and fibrous substances. March 25; six months.

James Hay, of Belton, Scotland, captain in the Royal Navy, for an improved plough, which he titles the "Belton Plough." March 25; six months.

Henry Philip Rouquette, of Norfolk street, Strand, merchant, for a new pigment. (A communication from a foreigner.) March 25; four months.

James Sabberton, of Great Pulteney street, Golden square, tailor, for a fastening to attach straps to the bottoms of trowsers. March 26; two months.

Alexander Southwood Stocker, of Birmingham, manufacturer, for certain improvements in manufacturing tubing, or tubes, which are applicable to gas and other purposes. March 27; six months.

Richard Prosser, of Cherry street, Birmingham, C. E., for certain improvements in machinery, or apparatus for manufacturing pipes. March 27; six months.

Henry Kirk, of Upper Norton street, Portland place, merchant, for improvements in the applications of a substance or composition, as a substitute for ice for skating and sliding purposes; part of which improvements may also be employed in the manufacture of ornamental slabs and mouldings. March 28; six months.

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VOL. I.

REMARKS ON THE DAGUERREOTYPE.

BY JOHN W. DRAPER, M. D.

PROFESSOR OF CHEMISTRY IN THE UNIVERSITY OF THE CITY OF NEW-YORK.

Of copying objects by Artificial Light.—It has been known for many years, that chloride of silver would become dark, when exposed to the light emitted from incandescent lime before the oxy-hydrogen blow-pipe, or to the galvanic discharge between charcoal points. The same effect takes place much more promptly with iodized silver. I arranged a gas microscope with a lime pea, and also with charcoal points; and procured an impression of a part of a fly's wing without any difficulty. The same result was also obtained by means of Drummond's light: a jet of oxygen passing through the flame of a spirit lamp, and directed on a piece of lime.

The image of an argand gas-light being received in the camera, at a distance of about ten feet, upon an iodized plate, for three quarters of an hour gave a very strong and well-defined result.

On holding a similar plate, one half of it being screened by a piece of tin-foil, within two inches of the same flame, in three quarters of a minute the exposed portions were strongly affected, and in a minute and a half had begun to turn black.

I placed a flat gas-burner (bat's-wing) in a magic lantern, and received the image of one of the grotesque transparencies,

on a plate three inches square : in half an hour, a very fair representation was obtained.

Of images of the Moon.—The rays of the moon, reflected by the mirror of a heliostat, were made to pass through a lens four inches in diameter, and fifteen inches focus. The image, when received on an iodized plate, was about one-sixth of an inch in diameter. After an exposure of half an hour, the plate was mercurialized, and a very well marked result obtained. It appeared however to have been exposed to the light too long, as it had commenced to blacken.

The moon being about seventeen days old, by means of two lenses I obtained an image of her nearly an inch in its longest diameter ; and to this, for three quarters of an hour, an iodized plate was exposed. The mercury bath evolved a chart, which was however deficient in sharpness ; partly owing to defects in the optical arrangement, but chiefly on account of the difficulty of making the heliostat follow the course of the moon with accuracy. The position of the darker spots on the surface of the luminary was distinct.

Of making Duplicates of Daguerreotypes.—There is no difficulty in making copies of Daguerreotype pictures of any size. The proof from which a duplicate is to be taken, should be placed in a full light, and in such a position as respects the incident light, that its lights and shadows may come out with the utmost clearness. During last winter I made many copies of my more fortunate proofs, with a view of ascertaining the possibility of diminishing the bulk of the traveller's Daguerreotype apparatus, on the principle of copying views on very minute plates, with a very minute camera ; and then magnifying them subsequently to any required size, by means of a stationary apparatus. These arrangements will probably add great facilities to the practice of the art.

Of the Rays which affect the Iodized Plate.—It is commonly supposed that these are identical with what are generally called in the books on optics, "the chemical rays ;" rays which are situated in the most refrangible portion of the spectrum. This is, however, an error. The point of maximum intensity for Daguerre's ray, lies within it in the region of the blue. Before

the paper of Mr. Towson, in the London and Edinburgh Journal of Science, had reached this country, last November, I had determined the proper focus for the Daguerreotype. In truth, every ray except the yellow, leaves an impression on the iodine. Theoretically, therefore, it would seem, that in order to obtain perfect pictures, an achromatic lens is absolutely necessary. A more attentive consideration of the matter soon convinced me, that lenses in which the chromatic aberration was uncorrected, might be employed, provided care was taken to remove the plate from the camera at a certain period. For the impressions of light upon the retina are solely regulated by intensity; but in the action of a decomposed beam on an iodized plate, *time* enters as an element. Suppose, therefore, a plate be exposed in the camera during the space of five minutes, in light of a certain brilliancy, if the focus has been adjusted to the focus for blue light, a neat picture may be obtained; for these being the rays in which the action is at a maximum, they *will have had time* to make a complete and perfect impression, whilst the red and violet rays *will not have had time* to give any perceptible effect. Upon these principles, I found that very sharp pictures might be obtained, not merely by spectacle lenses an inch in diameter, but also by means of lenses of three or four inches aperture, such as have since come into common use. The first portrait I obtained last December was with a common spectacle glass, only an inch in diameter, arranged at the end of a cigar box.

The risk of failure by employing an uncorrected lens, is greater than the risk by a good achromatic, or a reflector.

Of the methods of removing the Iodine from the Plate.—Daguerre recommends two agents for the removal of the sensitive coating—hypo-sulphite of soda, and solution of common salt. The former acts very well, but is somewhat expensive; the latter often fails, and the proof is ruined. There is however a process far better than either, which succeeds without any difficulty, and is of no expense.

Having taken a clear and moderately strong solution of common salt, place the proof in it, and *touch it* at one corner with a little piece of zinc that has been scraped bright. The instant

that contact is made, the iodine is seen disappearing like a mist from the surface of the plate, commencing at the point where the zinc touches it, and gradually progressing to the further extremity. The plate is then to be washed thoroughly with water.

This process, which adds not a little to the magic of the whole operation, depends on the following principle: The silver surface, and the zinc plate in contact, form a simple voltaic couple. The zinc taking oxygen from the saline solution, hydrogen is evolved from the silver; but being in a nascent state, it unites at once with the film of iodine, forming hydriodic acid, which is very soluble in water.

The hypo-sulphite of soda and the zinc plate, therefore, act in different ways: the former dissolving off the iodide of silver, the latter decomposing it. Pictures cleaned in this way are not of that slaty blue color, which some that have been treated with hypo-sulphite of soda possess. They are of a warm cream tint.

[For the American Repertory.]

GEOLOGY OF THE STATE OF NEW-YORK.

Report of the New-York State Geological Survey for the year 1839.

(CONTINUED.)

In the last number of this journal we gave a very brief analysis of the reports of Messrs. De Kay, Torrey, Conrad, and Beck. The next in order of publication is that of Dr. E. Emmons.

This report is chiefly occupied with a description of the mineral deposites in the northern sections of the state, particularly in the counties of Essex, Clinton, St. Lawrence, and Jefferson. An attempt is made to determine their geological position with exactness, and ascertain the indications of their presence, in order that a system of rules may be formed, by which the miner may judge of the presence or absence of any given mineral production in a given formation.

The *iron ores* of Clinton county occur mostly in granite, and are the magnetic oxide, generally black in the mass and streak, and they form veins which traverse the rock in directions nearly

north and south. The general direction of the strike of the rock is north-east and south-west. The veins accordingly cut the strata at a small angle, both in the prolongation north or south, and also in their direction downwards. The entire width of vein of iron ore in the Clintonville district, Prof. E. estimates at about 150 feet; and in the Newcomb mineral district at 1484 feet. In consequence however of the scarcity of fuel, the prospect for the future is not so cheering to the manufacturer of iron as could be wished. Unless means of communication be furnished to the wooded districts of the Saranac and Upper Au Sable, the present highly flourishing establishments for the manufacture of iron must in time be abandoned; and, as it would appear, at a period when the demand for it will be greater, and when every attending circumstance will be favorable to the production of a better material at a diminished cost.

The amount of iron ore in this region is inexhaustible. Its value at the mine, after it is raised and dressed, varies from four to six dollars. The establishments for the manufacture are increasing. Though generally small, still they are profitable; and could the forest at the western boundary of the county become more accessible, it would be all that is required to give perpetuity to the present establishments, and also encourage many more, all of which could not fail of making this district one of the most flourishing in the state.

More than thirty pages of Dr. Emmons's report are occupied with an account of the iron ores in the towns of Newcomb and McIntire, in Essex county, with general remarks relative to the geology of this section of country, and some theoretical views connected with practical points in reference to these deposits. Dr. E. remarks, that "probably no portion of the world can vie with McIntire in its ores of iron: even the far-famed iron mountains of Missouri are eclipsed by the rich ores of Essex county, New-York; and if not in quantity, at least in quality; for the ores of those iron mountains contain quite a large amount of sulphuret of iron, which must injure the quality of iron produced from it." Professor E. gives a very full and satisfactory account of the quantity and quality of the iron ores in the coun-

ties above mentioned, together with their localities, geological relations, and the peculiar advantages attending their manufacture ; all of which must be of great interest to those engaged in this important branch of business.

Accompanying Dr. E.'s report is a very valuable communication of about twenty pages, from Prof. Farrand N. Benedict, of the University of Vermont, giving an account of the measurements of the mountains in the northern section of the state, and some just observations as to the relative value of barometrical and trigonometrical measurements in general. According to Prof. B. Mount Marcy is 5537 feet above tide water, instead of 5467, as obtained by Mr. Redfield in 1838. In relation to the comparative merits of barometrical and angular measurements of great elevations, Prof. B. remarks as follows :

“ The barometer and theodolite have their peculiar capabilities and defects ; and the exact measurement with either, of a mountain covered with clouds during the greatest portion of the year, and surrounded by an atmosphere subject to incessant change, demands more perfect instruments and skill in their use than is generally apprehended.

“ The chief difficulty that the barometer has to contend with, and one over which it has no direct control, is a want of uniformity in the changes of atmospheric pressure, in different places, at corresponding times. As correct observations have been multiplied, more harmony in this respect has been detected than had formerly been supposed. Indeed, this is not the only department in which nature has been held accountable for blunders due to clumsy instruments and unskilful observers. This difficulty, without doubt, exists to such an extent as to impair confidence in single sets of observations at least, with whatever care they may have been made. The atmosphere, whether charged uniformly with vapor or not, must evidently have a strong tendency to equilibrium ; and a derangement of it, within moderate distances, must consequently be transient. For this reason, a course of consecutive observations at the same station should always be taken, which will enable the observer to guard against error, either by rejecting all, or selecting those that in this way are shown to be worthy of confidence.

“The corrections for the hygrometrical state of the atmosphere are undoubtedly more or less imperfect, although that portion of the error which yet remains unprovided for, I apprehend, is comparatively inconsiderable. La Place measures these effects by the temperature of the air, and observes that this hypothesis very nearly satisfies the observations that have hitherto been made. The agreement of my results, where *courses* of observations were taken, intimates with what degree of approximation I have corrected for the changes of the weather. This agreement is particularly worthy of remark in relation to Long Lake, where the observations were protracted in time, and the weather singularly variable. But notwithstanding all this, I am free to admit that these corrections are still less perfect than could be desired.

“The theodolite is above the need of eulogium from any one; but, like every other human invention, it has its proper capabilities and defects. An indispensable condition to the accuracy of angular measurements is the exact determination of a base line—a work which requires that skill, variety of delicate instruments, time, and means, which in this country are not at the command of a single individual. Triangulations, embracing great extent, have been executed with astonishing precision, and the results of similar measurements, properly conducted, are entitled to the utmost confidence; on the contrary, the angular determinations of high mountains have been comparatively vague. One cause for this difference consists in the great distances at which mountains are generally observed, and the consequent smallness of the angles of elevation. In this respect a condition is almost necessarily violated, which was scrupulously satisfied in the surveys just referred to.

“The chief source of error in mountain measurements, and one which distinguishes it from horizontal ones, is refraction. This difficulty, growing out of the condition of the air, and independent therefore of the instrument, is analogous to the one which the barometrical method is exposed to, with this difference in favor of the latter, that the atmospheric changes going on at both stations may be detected and compared.

“Refraction differs, in different countries, and at different

times, from $\frac{1}{14}$ th to $\frac{1}{8}$ th of the distance, reckoned in minutes. Such being the uncertainty as to the true path of light in low and familiar regions, it must be particularly difficult to follow it with precision through mediums of changing relations, and elevated tracts comparatively unknown. Refraction, too, depends not only upon the affections of the air, but upon the relations of the line of sight with other objects. Every one who has used the spirit-level, is aware of the errors that he is exposed to, when, in clear weather, his line of collimation approaches logs and fences on the surface of the ground."

To illustrate the uncertainty of the measurements of mountain elevations, Prof. B. refers to the Peak of Teneriffe as an example, the height of which varies, according to geometrical measurements made by different observers, from 1700 to 2600 toises; and by barometrical observations, from 1900 to 2025 toises: thus showing that results obtained by geometrical operations, differ more from each other than those found by the barometer. It would, however, be wrong to cite this want of harmony as a proof of the uncertainty of all measurements of mountains; for, as Humboldt in his Personal Narrative well observes: "Angles, the value of which is determined by imperfect graphometers; bases that have not been leveled, or the length of which has been determined by the log; triangles that give an excessively acute angle at the summit of the mountain; heights of the barometer, without any notice taken of the temperature of the air and of the mercury; unquestionably are not means calculated to lead to accurate results."

Prof. B. suggests a connection of the Saranac river, which empties into Lake Champlain at Plattsburgh, with Racket river, which empties into the St. Lawrence near St. Regis. From his calculations, it appears that by excavations equal in the aggregate to $6\frac{1}{2}$ miles, and an amount of 240 feet lockage, continuous lines of batteaux navigation through, and connecting these two rivers, may be formed, equal in extent to 210 miles; and that this would be increased to more than 300, if we take into consideration the coasts of the lakes.

Dr. Emmons concludes his valuable report with the following *hints to agriculturists*:

“1. *Drainage.* The cure of a very common evil, that of a cold, wet soil, may be effected by knowing the nature of the rock which constitutes the substratum. Springs which supply this excess of moisture, issue from reservoirs formed in the cavities of rocks; and it is a very common circumstance that the issue of water is at the edge of the jointed rock, or perhaps the efflux of water is determined by a fault. In either case, the remedy is to drain the water into the joints of the rock. It may be, however, that drainage cannot be effected. The nature of the substratum or rock determines the question. Geological knowledge is required, in the first place, to know how; and in the second, to determine when, it is possible to effect it.

“2. *Wells, and boring for Water.* The place for boring for water may be determined by the direction of a *fault*. Springs may generally be found at a *fault*, whether that is in a solid rock, or in a clay bed; for the layers of many stratified rocks, and of clay, being impervious, the water will flow along the layers till it finds some obstruction; that obstruction will be in the line of a fault, when it may be brought to the surface by piercing to the layers on this line.

“3. *Valuable Materials below the Surface.* Substantial products for enriching the soil often exist a few feet only from the surface. It may be *peat*, or *marl*, or *marly clay*. A little geological knowledge is necessary for the determination of the question.

“4. *Building Materials.* *Durability* is the main question to be determined. The layers of any given rock are not equally durable. Rocks, or those portions which are pulverulent, or are acted upon by atmospheric agents, though they are worked easily, are to be rejected; while those layers which project, and have withstood the elements, may be selected.

“5. *Knowledge of Soil, Substrata, and Water.* This knowledge may be valuable, not only as it regards crops, but cattle; for, as in the vegetable kingdom some species prefer a certain soil, so in the animal there are some species which express a similar choice, and manifest the result by health, thrift, and a good condition. Goodness of soil does not wholly depend on chemical composition, and a certain mechanical mixture, but is

influenced by substrata, mostly in consequence of their conductivity of heat, and their power of absorbing water. Hence, the questions of a change of crop, or change in the range for cattle, often rests on geological data."

The next report in order is that of Lardner Vanuxem, of the third district. The former reports of this gentleman embraced the counties of Montgomery, Fulton, Herkimer, Oneida, Oswego, Madison, Cayuga, and some parts of the more southern counties of the district. The present embraces only the rocks of Lewis county, with a synopsis of the rocks and formations, 35 in number, besides the primitive, with the names of the fossils which they embrace. As the report does not well admit of analysis, we pass on to the next, which is that of the Fourth Geological District, by James Hall, embracing the counties of Steuben, Allegany, Cattaraugus, Livingston, and Genesee. The rocks which come within the limits of his survey, are the Onondaga saliferous group, including the plaster beds, the hydraulic limestone, the Onondaga and Seneca limestones, and the fossiliferous shales. If coal exist in the state of New-York, it is doubtless to be sought in the southern tier of counties, near the Pennsylvania line; but even here, in the opinion of Mr. Hall, it cannot be expected to be found in workable quantities. A conglomerate is found in Cattaraugus county, particularly near Olean, some five hundred feet above the Allegany river, very similar in appearance to that which overlies the anthracite beds of Pennsylvania; but on examination, it is found to dip down, so as to lie far below these beds, so that there is no good reason to believe that the carboniferous strata exist beneath it. Though the mineralogical character of the rocks is similar, yet this alone is not sufficient to determine the question. Their relative position is also to be considered; and this is adverse to the supposition that coal exists in this region in any quantity.

A considerable portion of Mr. Hall's report is occupied with an examination of the proofs of the former existence of an inland sea, which was subject to successive drainage, at outlets of different elevations. This is supposed to have occupied the basin, bounded on the north by the range of mountains extending through Canada to the far west, on the east by the New England

range, extending south-westerly by the Highlands of New-York and the Alleghanies to Pennsylvania; thence west and south towards the Mississippi river, and probably to the Rocky Mountains. These ranges of mountains must have presented a barrier to the enclosed waters, of 1000 or 1200 feet above the level of the ocean, and were subsequently broken through by the St. Lawrence, the Susquehanna, the Hudson, and partially by the Mohawk at Little Falls; and it is rendered very probable that the Connecticut river once formed the outlet of this immense sea. The vast quantity of boulders, and other transported materials, covering the surface of Long Island, and which can be traced to rocks in place in Connecticut, prove that a violent and powerful current has at one time flowed down the valley of this river. A stream, of the magnitude of the St. Lawrence, Mississippi and Susquehanna united, it is supposed, would produce this effect; and such a stream probably flowed down this valley as the outlet of the great inland sea, till that was reduced below the level of 1000 feet above tide water. Our limits do not allow us to go into an examination of this theory; but it strikes us that Mr. Hall has nearly if not quite demonstrated its truth. The drainage, at successive periods, of different portions of this great basin, furnishes a key to explain many of the most important geological phenomena of the state.

We have thus briefly passed the geological reports of the past year in review, and noticed a few of the very numerous and important topics discussed in them. Our object has chiefly been to glance at some of their contents, and say enough to induce our readers to procure and examine them for themselves, believing that they will find in them a mass of useful and interesting facts. Since our last number was issued, the Legislature of the State has authorized by law the continuance of the geological survey for another year, which will probably bring it to a successful termination. The state of New-York can then boast of possessing a fuller and more satisfactory account of her natural resources than any state in the Union, or indeed of any country on the face of the globe. That nothing will be left unexplored or undiscovered, is not to be expected; but what has been done will serve as a guide or landmark for the direction

of the hosts of observers and cultivators of natural science who are to spring up in every quarter of our empire state. Curiosity will thus be stimulated, zeal directed, enterprise rewarded, and all will contribute to the grand desideratum—the promotion of the welfare and happiness of the human family. L.

For the American Repertory.

THE ART OF BUILDING.

BY JAMES FROST.

No. VI.

In looking at a map of New-York, if we compare the unceasing care and labor bestowed on the plan and formation of streets, squares, and avenues, with the neglect and inattention to either the form, situation, or dimensions of the piers and wharves ; if we could estimate the millions already so freely expended in blasting rocks, in removing immense hills, in reducing to a regular grade so vast an extent of rugged surface as would already conveniently locate thrice the present inhabitants of the city ; if we could compare this profuse expenditure of skill and money, with the parsimonious outlay for ill-contrived and insufficient water frontage, in which business is so inconveniently and so dearly transacted, we should doubtless be lost in wonder at the contradictions involved in the comparison.

The extensive water frontage of the city presents no obstacle or difficulty to the prosecution of any rational or noble plan of improvement ; and it requires but the touch of genius to develop unsurpassable conveniences for commerce, and without the expenditure of a single dollar for architectural display or decoration. The economical improvement alone of the water frontage would, from its vastness, gradually acquire and soon present a far more attractive, interesting, and grand aspect, than any factitious architectural decoration whatever. In fact, such almost interminable lines of enduring warehouses, of convenient, spacious docks, and of splendid ships, would as far excel any architectural show, as utility surpasses inutility.

The great inconvenience sustained by individuals, and the

heavy expenses incurred by the community for the enlargement of ancient, narrow streets, should operate also as a serious warning against a continuance of the present injudicious construction of piers and wharves, as similar inconveniences and heavy losses must ensue from farther neglect. Thus the speedy adoption of a good and regular plan for their improvement and effectual construction, will be the cheapest; and such a plan will also be imperatively demanded by the new circumstances arising from and connected with the ample supply of water about to be furnished from the Croton river. For it must be apparent, when that supply is furnished, sufficient sewers must be constructed for the effectual discharge of the drainage of the city, and for which the natural situation of New-York is so admirably adapted.

But these sewers are very extensive works, and seem to be strangely overlooked; for, with a very few exceptions, they have yet to be made; and without exception, every proper discharging orifice has not only to be made, but to be planned; and their very site has yet to be found, which cannot be done with propriety until the situation and formation of the piers and wharves have been maturely considered and arranged. For it must be apparent on the completion of the aqueduct, that large streams of dirty water will be incessantly pouring into the streets: in summer, an insufferable nuisance; in winter, an intolerable obstruction.

Another imperative demand for sewers will be found in the general employment and unlimited desire for water closets—those admirable modern combinations of utility, cleanliness, and decency. These motives alone will be found so powerful as to render sewers generally indispensable. Other inducements would also occur to humane and reflecting minds, desirous of relieving humanity from an odious and unhealthy employment, which no man but the vilest criminal should ever be permitted to exercise.

The discharge of the sewerage into the docks, as at present, must be contemplated as an indecent and indefensible custom; and in future, when, in addition to the vastly increased discharge consequent on the great increase of population, is added

the enormous quantity of soil from the water closets, as it ought to be and will be, instead of from innumerable pestilential privies, where being long accumulated, it remains, the boundless source of the foulest noxious exhalations, and of contagious diseases.

If these indescribable accumulations be continually discharged into the docks, would not that circumstance be so odious as to be disgraceful to any civilized community, and soon become intolerable?

Now the only reason why the drainage of the city—the fetid mud, sand, &c.—is discharged into the docks, as at present, is the prevailing imperfect construction of the wharves and piers, which absolutely prevents the continuance of the drains to deep water. Were they constructed as heretofore described in these papers, sewers might be continued through their whole length free of expense, and the contents be thence discharged into deep tidal water, without trouble, expense, or the possibility of future annoyance.

It has been objected to these general views of improvement, that many of the piers and wharves are private property, and cannot therefore be taken into a public improvement. Now, are not houses private property? Does this interrupt the improvement of a single street—an object of such inconsiderable value, compared with one affecting the appearance of our great metropolis, and the general welfare of so large a community?

Again, as these improvements will be equally beneficial to the holders, whether comprising individuals, public bodies, or the corporation of the city, it seems as unlikely these advantages should be unappreciated by individuals as by the other classes.

The advantages attendant on the construction of better piers being so great, it is impossible they can be long neglected or misunderstood. In the mean time, in many instances—nay, in all—wherever the present piers are already rightly located, although insufficient in magnitude, and though partly formed of perishable materials and consequently liable to speedy decay, they may be easily increased to an ample size, and improved into enduring structures, by the foundation of a concrete stone wall on each side and front of the pier, and of such thickness

as will afford the additional space required upon the pier for the convenient transaction of business thereon, and for the small additional area required for the pillars and arches to support a range of warehouses overhead.

Thus and easily may many of these insufficient structures be increased to ample dimensions ; thus and readily may many of these perishable structures become imperishable ; and at such a moderate cost, too, when compared with the increased advantages attained ; and probably by no other means can so much property be so increased in value at so little expense. For, first, the whole outlay may in some cases be no more, or may even be less, than the unavoidable expense that is ever advancing, and must soon occur from the decaying nature of the materials of the present piers. Hence, where a certain expense is only anticipated awhile, it can hardly in such cases be said to be incurred at all.

Secondly, the proper and enduring external additional walls will afford a sufficient foundation on which pillars and arches may be erected, to support substantial and enduring warehouses overhead ; and all entirely independent of the old wharf, which being ever liable to uncertain settling, at distant periods, will remain appropriated for a road-way, and for which only it is properly adapted.

Thirdly, this pier being every where covered, becomes of much more value intrinsically as well as of greater extent, as all goods landed and persons transacting business thereon, will be protected from the weather in all seasons.

Fourthly, while all these advantages are secured at so little cost, the piers become in addition thereto the most valuable sites for building, affording an ample and stable support for enduring and incombustible warehouses, which may be erected on these artificial foundations as cheaply as elsewhere in the city. These sites then are clearly on this account alone, and for this additional purpose only, at once so improved, as to be, independent of their present worth, as much more valuable as the prime cost of other sites for warehouses.

But when the favorable nature of their position is considered—the cheap and secure storage and the ready re-shipment of

merchandize, in transit only, whereon the expense of labor will be greatly reduced by machinery; the double expense of carting to distant places wholly saved, and many other minor expenses and troubles avoided—it must be evident that these combined advantages will much farther and eminently increase the value and rental of the piers, and the profit of the merchant, from the greater security, dispatch and economy thereby effected.

CHINESE COLLECTION, PHILADELPHIA.

This splendid museum was collected by Mr. Nathan Dunn, at an expense of nearly \$100,000, and stands preëminent for its attractions, even in that city so famed for its objects of interest to the curious and scientific.

The apartment containing the collection is 163 feet in length, by 70 in width, with lofty ceilings supported by 22 pilasters. On entering, the visitor can readily imagine himself in the Celestial Empire, for the scene is imposing in the highest degree. The colors of silks, embroideries, crapes and other fabrics, are varied, and beautiful beyond description, and far surpass the best English or French dyes. Two large china vases, near the entrance, are unique samples of this species of manufacture, and cannot be equaled in any other country. The portraits of Taou-Kwang (Emperor of China) and his consort, are fine specimens of Chinese color: the drawing and composition are, however, very faulty. There are several cases containing wax figures as large as life, selected from every rank, and dressed in full costume. Those of the upper classes are of fabrics much more costly and beautiful than ever imported to this country as articles of merchandize.

Case No. 1 contains two mandarins, of the first and second class, each by his dress and appearance strongly marking his grade or *pin*. The nominal rank of mandarin may be purchased of the emperor; but his celestial highness places so high a price upon his favors, that but few can avail themselves of them. It is said that Houqua, who is so well known to the New-York merchants, and whose likeness is in this collection, paid the emperor \$100,000 for the title of mandarin.

Persons are selected in China, to fill civil offices, with an almost exclusive reference to their talents and education ; consequently the government seldom has occasion to change them. Wealth, titular nobility, and purchased rank, have their influence ; but unless accompanied by personal merit, and above all by education, their power is comparatively limited and feeble. The emperor chooses for his officers none but men of the highest attainments and most commanding abilities.

The second case comprises mandarins of inferior rank, (of which they have nine grades) and their attendants. Each case contains, beside what has been enumerated, many articles of furniture, and other things peculiar to the country from which they were brought : some of the descriptions, and such other information as may prove instructive, we extract from the catalogue :

“ Beside the match-lock and shield, a variety of weapons, offensive and defensive, are in use in China ; such as helmets, bows and arrows, crossbows, spears, javelins, pikes, halberds, double and single swords, daggers, maces, a species of quilted armor of cloth, studded with metal buttons, &c. &c. The standing army of the Celestial Empire numbers about 700,000 men, of whom 80,000 are Tartars, the rest native Chinese. The military power of ‘heaven’s son’ appears formidable in figures, but has little claim to be so considered in reality. If the universal testimony of eye-witnesses is to be taken as proof, the army is but little better than a rabble rout—mere men of straw—destitute of discipline, bravery, science, skill, and every other soldier-like quality. Of artillery they know nothing. They have no gun-carriages ; their cannon being fixed immovably in one position. When the Sylph and Amherst British men-of-war sailed up the coast, the Chinese soldiers threw up numerous mounds of earth, and whitewashed them, to give them the appearance of tents !”

“ The costume of the Chinese, as displayed in this collection, forms an interesting subject of observation. The dress of every grade of society in China is fixed by usage. The wealthier Chinese are extravagantly fond of showy dresses ; and a well-provided wardrobe is an object of great pride. Handsome

garments often descend as an heir-loom, from generation to generation, and constitute the chief riches of a family. A deficiency of clean body linen is not regarded as a calamity by a Chinaman : a fair outside is what he mainly covets, being little heedful of either the quality or condition of what is underneath. The change from a summer to a winter costume, and *vice versâ*, is made simultaneously throughout an entire province ; the viceroy setting the example, by assuming a cap appropriate to the season."

We are sorry our space will not permit us to review the entire exhibition ; but did we do so, it would require an entire number at least to do it justice : we have as yet spoken of but three items of a collection containing 1075 specimens, each of which is equally interesting with those described. We would advise the young men of New-York, before taking the fashionable European tour, to spend at least one week in examining the Chinese museum ; for were it situated at Rome or Florence, and required six months time and the expenditure of a few thousand dollars to see it, it would undoubtedly be considered the principal attraction.

For the American Repertory.

LYCEUM OF NATURAL HISTORY.

PROCEEDINGS.

January. Dr. De Kay read some extracts from a translation of an early history of this country, written in the Dutch language, by Adrian Vanderdecker, in 1651. In this work the bison, now found only west of the Mississippi, is spoken of as being very common in this state ; and several other animals are mentioned, which cannot be identified with any now inhabiting this country. Dr. De Kay also exhibited several numbers of a splendid work on the Zoölogy of Italy, by Charles Bonaparte, entitled "Iconography of the Italian Fauna."

The Memoirs of the Royal Academy of Sciences of Turin, Vol. 40th, for 1838, was received from the Academy. The President presented the 4th Part, Vol. 1st, of the Journal of the Geological Society of Dublin.

February. Mr. Redfield made some remarks respecting the differences of level between the Dead Sea and the Mediterranean. He stated that the observations of late English travellers had shown that the boiling point of water stood 213° at the Dead Sea, indicating a depression of the level of about 500 feet. Barometrical observations have confirmed this; and have also shown that the Lake of Tiberias is more than 500 feet lower than the Mediterranean.

Dr. Jay presented a prepared skeleton of the common domestic fowl. Mr. Halsey laid before the Society the first number of the Lepidoptera, or descriptions of butterflies indigenous to the state of New-York. The Memoirs of the Royal Academy of Sciences of Turin, Vol. 39, for 1837, were received from that Society. Mr. W. C. Redfield presented a pamphlet, "On the Courses of Hurricanes, with Notices of the Typhoons of the China Sea." The transactions of the Zoölogical Society of London, Vol. 2, Parts 2 and 3, and the proceedings of the same Society, were received from its secretary. Dr. Boyd presented a specimen of concretionary limestone from an island in the Hudson river, opposite Troy; also, three fossil shells from the west coast of Africa. Report on the Alabama, Florida and Georgia Railroad was received from Mr. C. A. Davis. Mr. D. H. Nevins was elected resident member. The annual dues of the members were reduced from eight to four dollars.

March. Dr. Jay made some remarks upon the effects of the late gale in altering the south shore of Long Island, near Rock-away, and upon the quantity of shell-fish thrown ashore. Mr. I. Cozzens observed that the quantity was so great, that between twenty and thirty wagons had been engaged several days in carrying them away for agricultural purposes. The shells were unusually large, and consisted principally of the *natica duplicata*, *N. heros*, and *pyrula caniculata*. He also stated that very large lobsters had been cast ashore: this is considered remarkable, as these animals are generally supposed to frequent only rocky shores. Mr. W. C. Redfield made some remarks on the formation of bars at the mouths of rivers, in which he showed that the bars were produced by the action of the waves upon the neighboring coasts, and not by the current of the river

carrying down sand, and depositing it at the mouth, as is commonly supposed. These bars are invariably found to be composed of materials of the neighboring beaches, and not of the shores of the river; and Mr. R. further stated that the water inside of the bar, and for miles up the Hudson, is deeper than on the outside. Dr. De Kay read some extracts from a work lately published by Prince Charles Bonaparte, on the geographical distribution of the birds of America and of the eastern continent, in which it is affirmed that only 70 birds are common to the two continents: he also called the attention of the society to the difference in the views of the author as set forth in his present classification, and those which he entertained when he published his "Synopsis of the Birds of the United States."

Dr. Boyd presented the following minerals: micaceous oxide of iron, yaenite or striped cleavelandite, from Fort Lee; stilbite, datholite with apophyllite, from Bergen Hill, N. J. The Flora of Terre-Neuve and the isles of St. Peter and Miclon, was received from the author, Baron de la Pylaie. Mr. Bell presented specimens of *natica duplicata*, *N. heros*, *astarte castanea*, *mytilus edulis*, from Raynor South, Long Island. The transactions of the American Philosophical Society, the proceedings of the same Society, Parts 1 to 5, and a Dissertation on the Nature and Character of Chinese Writing, by Mr. Duponceau, were received from that Society.

April. Dr. S. Akerly read the introductory chapter to the memoir of Dr. Samuel L. Mitchill, the first President of the Society, prepared at the request of the Lyceum. Dr. Smith made some remarks on a dissertation on the origin and formation of trap and basaltic rocks, lately published, in which the authors state that when trap rock is distilled, ammonia is produced; but when basalt was treated in the same manner, none was liberated. From the experiments made upon these rocks, the authors conclude that they are of animal origin; and that the basalt having been subjected to a greater heat than the trap, the ammonia had been driven off. Mr. W. C. Redfield mentioned that in the granite blocks used in the construction of the new Exchange, a number of very curious spots were to be seen, which had all the appearance of fossils. Mr. Cozzens announced

that he had found anthophyllite in place, on this island, near 60th street. Mr. W. C. Redfield gave an account of a gale of wind off Sable Banks, in which the vessel was kept before the wind during the gale, and the courses noted and traced upon the chart : it was found that the vessel had described an arc of a circle.

Professor Briggs presented a cast of the lower jaw of the *Castoroides Ohioensis*, found in Licking county, Ohio. The Boston Journal of Natural History was received from the Society. The Memoirs of the Imperial Academy of St. Petersburg, Vol. 4th, Parts 5 and 6 ; Memoirs presented to the Academy, Vol. 3d, Parts 3, 4, 5 and 6, and Vol. 4th, Parts 1 and 2 ; and the Acts of the Public Session of the Academy for 1837 ; were received from the Society. Dr. W. Darlington presented a pamphlet, entitled An Essay on the Development and Modification of the External Organs of Plants : translated from the German of J. F. von Göethe. Dr. Jay presented, Catalogue of the Shells, arranged according to the Lamarckian system, together with descriptions of new or rare shells contained in his cabinet ; illustrated by several plates. The Librarian laid before the Society Nos. 82 and 88 of the London and Edinburgh Magazine, and Nos. 19, 22 and 27 of the Magazine of Natural History, received since the last meeting. The article on Physical Geography, from the 7th edition of the Encyc. Britannica, was received from Dr. Traill of London. The following were elected resident members : Dr. J. M. Quin, Mr. Abraham Benedict, and Mr. J. L. Vandervoort. The Curators reported that they had made a selection from the duplicate minerals to be presented to the Syracuse Library and Reading Association.

B.

ARTISTS' FUND SOCIETY OF PHILADELPHIA.

We acknowledge the receipt of an address, delivered by the Rev. Dr. Bethune, before this association, and seldom have we been more gratified than during its perusal. The author is evidently *au fait* in matters of history connected with the fine arts ; and from his enthusiasm as an amateur, he has given full

vent to his *artistical feelings*. We would advise all lovers of the arts of design to give it an attentive perusal, for we have never seen this subject managed in a more masterly manner.

The Artists' Fund Society is somewhat similar to the National Academy of Design in this city, being under the control and management of the artists themselves, and not subject to the whims, affectations and caprices of *soi-disant connoisseurs* or patronizing aristocrats. Among its officers are found many of their first artists and most respectable citizens. The Philadelphians are generous supporters of the arts, and we do not doubt its entire and full success.

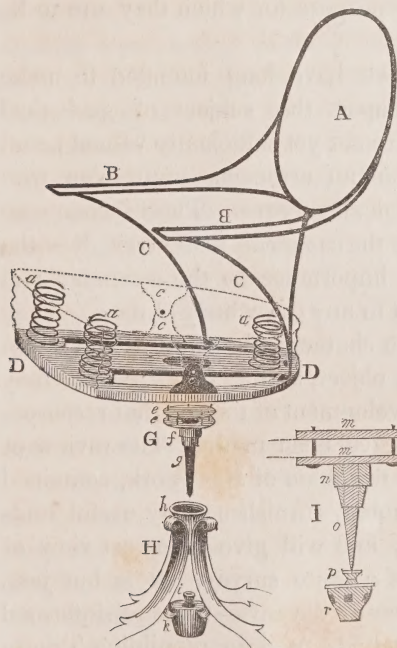
IMPROVED EASY CHAIR.



J. J. MAPES, Esq. :

SIR—I have to offer to your notice, a chair of improved construction, combining the advantages of strength, elegance and comfort, with mechanical arrangements, by which the seat revolves, with very slight friction, at the pleasure of the sitter,

and conforms itself to his position, whether leaning backward or forward. Persons of sedentary habits or avocations would derive great relief from the use of it, while its beauty of finish renders it as appropriate to the parlor and drawing-room as to the library or legislative hall. A soft, loose seat, which can be easily attached to or removed from the chair, renders it suitable for every season or clime.



Description.—A B C is an elastic iron frame, forming when cushioned a spring back. The stand H is also of iron, with sockets *h i* to receive the pin G, which is secured by flanges *e e* to the bottom of the chair: the position of this pin when in place, and its points of bearing, are more plainly seen in the cut section I. The dotted line designates a moveable seat connected with the bottom, as at *c c*, by rivets, which permit the back and front of the seat to be

raised or depressed, and at these parts it is attached to spiral springs, to give it the requisite degree of steadiness.

Yours, respectfully,

MATTHEW. W. KING, *Patentee.*

New-York, June 16th, 1840.

Mr. King has omitted one important item in his communication, which is, that the chair may be seen at his wareroom, No. 365 Pearl street: and seen it should be, by all who need its peculiar comforts.

MECHANICS' VADE MECUM.

No. II.

In continuation of the remarks made in No. I. of this series, upon the injudicious use of materials in buildings and machinery, we may add that the error does not always consist in a disproportionate use of them, but sometimes depends upon a selection of materials unsuited to the purpose for which they are to be applied.

This leads to a remark we have long intended to make directly to the mechanic, upon the subject of geological reports. These documents are not yet sufficiently valued ; and that they are not, arises from an erroneous impression with regard to the nature of geological surveys. These, when conducted in a right spirit—as is the case with most if not all of the state surveys—are of more importance to the mechanic and manufacturer, as a class, than to any other body of men. They are not solely of the scientific character the name would seem to indicate, but have for their object, and as far as possible they have accomplished, a full development of the internal resources of each state in which they have been made. The review of the last Geological Report of the State of New-York, contained in this and the preceding number, furnishes many useful hints relative to building materials, and will give a correct view of the comprehensive nature of a state survey. It is but just, however, to add that the writer of the review was misinformed as to the quality of the sand-stone used in rebuilding Trinity Church, since that material is not identical with the inferior red stone so commonly used for sills, lintels, and other parts of buildings throughout the city, but possesses a hardness and durability rarely equalled in sand-stone, and perhaps alone possessed by the stone of that locality from which this was quarried. The mansion of R. L. Stevens, Esq. in Barclay st. built after the Egyptian style of architecture, is constructed of the same kind of stone, and shows in the fullest degree the beauty and fitness of this material for building purposes.

The most important property of a building material is strength. This consists in the inherent existence of two forces, termed

cohesion and *elasticity*. Materials, when used for mechanical purposes, are subjected to four kinds of stress or strain, by which the force of cohesion may be ultimately overcome, and a fracture ensue. These are—1. *Tension*, or any *stretching* force, by which they may be torn asunder, as in the case of ropes, tie-beams, king-posts, &c.—2. *Pressure*, or any *breaking* force, acting perpendicularly or obliquely to the direction of the length, as beams, levers, press-heads, &c.—3. *Compression*, or any *crushing* force, acting in the direction of the length, as in the case of columns, truss-beams, &c.—4. *Torsion*, or any *twisting* force, acting at either or both ends of a beam or rod, such as the axle of a wheel, a screw, &c.

Many delicate experiments have been made by Tredgold, Barlow and others, on the effects of these forces upon the cohesion of different substances, particularly woods and metals; and it is from the results of such experiments the tables have been constructed which we shall append to these papers. In order to make each number of the series, as far as possible, independent of the others, such remarks or explanations only as are relevant to the tables inserted will be given. The force now treated of will be pressure upon rectangular beams.

Investigations upon the strength of materials have shown that the greatest strain upon a beam resting horizontally on two supports, is produced when the load is placed midway of its length; and as there is a limit to the stress to which a beam may be subjected and yet recover its natural position when the pressure ceases, it would be unsafe to strain it beyond that degree. The table hereto appended shows this limit, in cast-iron beams placed as above named, with the load in the middle, which we shall, for perspicuity, call their *mean* load. Other conditions of the beam and load are provided for by the following rules:

1. When the beam is *fixed* at both ends, and loaded in the middle, multiply the mean load by $1\frac{1}{2}$.
2. When the beam is *supported* at both ends, and *uniformly loaded*, multiply the mean load by 2.
3. When the beam is *fixed* at both ends, and *uniformly loaded*, multiply the mean load by 3.

4. When the beam is *fixed* at one end, and *loaded at the other*, divide the mean load by 4.

5. When the beam is *fixed* at one end, and *uniformly loaded*, divide the mean load by 2.

6. When the beam is *supported* at both ends, and *loaded at a point not in the middle*, multiply $\frac{1}{4}$ of the mean load by the square of the length, and divide the result by the product of the lengths of the segments into which the beam is divided at the point of application of the load.

The numbers at the top of the columns denote the depth of the beam in inches, and those in the left-hand marginal column denote the length of bearing, or distance between the supports in feet: the other columns contain the weight in tons that the beam will bear with safety, the breadth being one inch; consequently the numbers found in the table must always be multiplied by the given breadth, to obtain the entire load.

The black lines that run across the pages, mark the point where the depth has arrived at that proportion of the length, when the beam becomes too rigid for bearing purposes, if exposed to any degree of impulsive force.

A few examples will render the use of the table manifest.

Example 1. A cast-iron beam, 2 inches broad, 18 inches deep, and 42 feet long, is placed horizontally on two supports exactly 40 feet asunder: how much will it bear suspended from the middle of its length, the elastic force remaining perfect?

In the table, under 18 inches at top, and opposite 40 feet in the left-hand column, stands 3.07 tons: this is the load that a beam one inch broad of the given dimensions will bear with safety; but the proposed beam is two inches broad, and the strength increases directly as the breadth; therefore, $3.07 \times 2 = 6.14$ tons, the entire load.

Example 2. A cast-iron beam, 18 inches broad and 40 feet between the supports, is required to bear 6.14 tons at the middle of its length, while the elastic force remains perfect: what should be its breadth?

In the table, under 18 inches at top and opposite 40 feet in the left-hand column, stands 3.07 tons for the load that a beam one inch broad will bear; therefore,

$$\frac{6.14}{3.07} = 2 \text{ inches, the required breadth.}$$

Example 3. A cast-iron beam, 2 inches broad and 40 feet between the supports, is required to bear 6.14 tons at the middle of its length, while the elastic force remains perfect: what should be its depth?

Divide 6.14 by 2, then opposite 40 feet in the left-hand column look for the quotient 3.07 in the body of the page, and above it, at the top of the column, will be found 18 inches, the required depth.*

* Turnbull on the "Strength, Magnitude, and Flexure of Cast-Iron and Timber Beams."

The Strength of Cast-Iron Beams—Breadth one inch.

Len. in feet.	DEPTH IN INCHES.								
	1	2	3	4	5	6	7	8	9
	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.
1	0.38	1.51	3.41	6.07	9.48	13.66	18.59	24.28	30.74
2	0.19	0.76	1.70	3.03	4.74	6.83	9.29	12.14	15.37
3	0.13	0.50	1.13	2.02	3.16	4.55	6.19	8.09	10.25
4	0.09	0.38	0.85	1.51	2.37	3.41	4.64	6.07	7.68
5	0.07	0.30	0.68	1.21	1.89	2.73	3.71	4.85	6.14
6	0.06	0.25	0.57	1.01	1.58	2.27	3.10	4.04	5.12
7	0.05	0.22	0.49	0.86	1.35	1.95	2.65	3.47	4.39
8	0.04	0.18	0.42	0.76	1.18	1.70	2.32	3.03	3.84
9	0.04	0.17	0.38	0.67	1.05	1.51	2.06	2.69	3.41
10	0.03	0.15	0.34	0.61	0.95	1.36	1.85	2.42	3.07
11	0.03	0.14	0.31	0.55	0.86	1.24	1.69	2.20	2.79
12	0.03	0.13	0.28	0.50	0.79	1.13	1.55	2.02	2.56
13	0.03	0.12	0.26	0.46	0.73	1.05	1.43	1.86	2.36
14	0.03	0.11	0.24	0.43	0.68	0.97	1.32	1.73	2.19
15	0.02	0.10	0.23	0.40	0.63	0.91	1.24	1.62	2.05
16	0.02	0.09	0.21	0.38	0.59	0.85	1.16	1.51	1.92
17	0.02	0.09	0.20	0.36	0.55	0.80	1.09	1.42	1.81
18	0.02	0.08	0.19	0.33	0.53	0.75	1.03	1.35	1.71
19	0.02	0.08	0.18	0.32	0.50	0.72	0.98	1.27	1.62
20	0.02	0.07	0.17	0.30	0.47	0.68	0.93	1.21	1.54
21	0.02	0.07	0.16	0.29	0.45	0.65	0.88	1.15	1.46
22	0.02	0.07	0.15	0.27	0.43	0.62	0.84	1.10	1.39
23	0.01	0.06	0.15	0.26	0.41	0.59	0.81	1.05	1.33
24	.....	0.06	0.14	0.25	0.39	0.57	0.77	1.01	1.28
25	.....	0.06	0.14	0.24	0.38	0.54	0.74	0.97	1.23
26	.....	0.06	0.13	0.23	0.36	0.52	0.71	0.93	1.18
27	.....	0.05	0.12	0.22	0.35	0.50	0.69	0.90	1.14
28	.....	0.05	0.12	0.21	0.34	0.49	0.66	0.86	1.09
29	.....	0.05	0.11	0.21	0.33	0.47	0.64	0.84	1.06
30	.....	0.05	0.11	0.20	0.31	0.45	0.62	0.81	1.02
31	.....	0.05	0.11	0.19	0.30	0.44	0.60	0.78	0.99
32	.....	0.05	0.10	0.19	0.29	0.43	0.58	0.76	0.96
33	.....	.....	0.10	0.18	0.29	0.41	0.56	0.73	0.93
34	.....	.....	0.10	0.18	0.28	0.40	0.55	0.71	0.90
35	.....	.....	0.10	0.17	0.27	0.39	0.53	0.69	0.88
36	.....	.....	0.09	0.17	0.26	0.38	0.51	0.67	0.85
37	.....	.....	0.09	0.16	0.25	0.37	0.50	0.65	0.83
38	.....	.....	0.09	0.16	0.25	0.36	0.49	0.64	0.81
39	.....	.....	0.08	0.15	0.24	0.35	0.48	0.62	0.79
40	.....	.....	0.08	0.15	0.24	0.34	0.46	0.60	0.77
41	.....	.....	.....	0.15	0.23	0.33	0.45	0.59	0.75
42	.....	.....	.....	0.14	0.22	0.32	0.44	0.58	0.73
43	.....	.....	.....	0.14	0.22	0.32	0.43	0.56	0.71
44	.....	.....	.....	0.14	0.21	0.31	0.42	0.55	0.69
45	.....	.....	.....	0.13	0.21	0.30	0.41	0.54	0.68
46	.....	.....	.....	0.13	0.20	0.29	0.40	0.53	0.66
47	.....	.....	.....	.....	0.20	0.29	0.39	0.51	0.65
48	.....	.....	.....	.....	0.19	0.28	0.39	0.50	0.64
49	.....	.....	.....	.....	0.19	0.28	0.38	0.49	0.63
50	.....	.....	.....	.....	0.19	0.27	0.37	0.48	0.61

The Strength of Cast-Iron Beams—Breadth one inch.

Len. in feet.	DEPTH IN INCHES.								
	10	11	12	13	14	15	16	17	18
	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.
1	37.95	45.91	54.64	64.13	74.38	85.38	97.14	109.67	122.94
2	18.97	22.96	27.32	32.07	37.19	42.69	48.57	54.83	61.47
3	12.65	15.31	18.22	21.37	24.79	28.46	32.38	36.55	40.98
4	9.49	11.48	13.66	16.03	18.59	21.34	24.29	27.42	30.73
5	7.59	9.18	10.93	12.83	14.87	17.07	19.48	21.93	24.59
6	6.32	7.65	9.11	10.68	12.39	14.23	16.19	18.28	20.49
7	5.42	6.56	7.81	9.16	10.62	12.20	13.88	15.66	17.56
8	4.74	5.74	6.83	8.02	9.29	10.67	12.14	13.71	15.37
9	4.21	5.10	6.07	7.12	8.26	9.48	10.79	12.18	13.66
10	3.79	4.59	5.46	6.41	7.44	8.54	9.71	10.96	12.30
11	3.45	4.17	4.97	5.83	6.76	7.76	8.83	9.97	11.18
12	3.16	3.82	4.55	5.34	6.19	7.11	8.09	9.14	10.25
13	2.92	3.53	4.20	4.93	5.72	6.57	7.47	8.43	9.46
14	2.71	3.28	3.90	4.58	5.31	6.10	6.94	7.83	8.78
15	2.53	3.06	3.64	4.27	4.96	5.69	6.47	7.31	8.19
16	2.37	2.87	3.41	4.01	4.65	5.33	6.07	6.85	7.68
17	2.23	2.70	3.21	3.77	4.37	5.02	5.71	6.45	7.23
18	2.11	2.55	3.04	3.56	4.13	4.74	5.39	6.09	6.83
19	1.99	2.42	2.88	3.37	3.91	4.49	5.11	5.77	6.47
20	1.89	2.29	2.73	3.20	3.72	4.26	4.85	5.48	6.14
21	1.80	2.18	2.60	3.05	3.54	4.06	4.62	5.22	5.85
22	1.72	2.08	2.48	2.91	3.38	3.88	4.41	4.98	5.58
23	1.65	1.99	2.37	2.78	3.23	3.71	4.22	4.76	5.34
24	1.58	1.91	2.27	2.67	3.09	3.55	4.04	4.57	5.12
25	1.52	1.83	2.18	2.56	2.97	3.41	3.88	4.38	4.92
26	1.46	1.76	2.10	2.46	2.86	3.28	3.73	4.21	4.73
27	1.40	1.70	2.02	2.37	2.75	3.16	3.59	4.06	4.55
28	1.35	1.64	1.95	2.29	2.65	3.05	3.47	3.91	4.39
29	1.31	1.58	1.88	2.21	2.56	2.94	3.35	3.78	4.24
30	1.26	1.53	1.82	2.13	2.48	2.84	3.23	3.65	4.09
31	1.22	1.48	1.76	2.07	2.39	2.75	3.13	3.53	3.96
32	1.18	1.43	1.71	2.00	2.32	2.66	3.03	3.42	3.84
33	1.15	1.39	1.66	1.94	2.25	2.58	2.94	3.32	3.72
34	1.11	1.35	1.61	1.88	2.18	2.51	2.85	3.22	3.61
35	1.08	1.31	1.56	1.83	2.12	2.44	2.77	3.13	3.51
36	1.05	1.27	1.52	1.78	2.06	2.37	2.69	3.04	3.41
37	1.02	1.24	1.48	1.73	2.01	2.31	2.62	2.96	3.32
38	0.99	1.21	1.44	1.68	1.95	2.24	2.55	2.88	3.23
39	0.97	1.17	1.40	1.64	1.91	2.19	2.49	2.81	3.15
40	0.95	1.15	1.36	1.60	1.86	2.13	2.42	2.74	3.07
41	0.92	1.12	1.33	1.56	1.81	2.08	2.37	2.67	2.99
42	0.90	1.09	1.30	1.52	1.77	2.03	2.31	2.61	2.92
43	0.88	1.07	1.27	1.49	1.73	1.98	2.26	2.55	2.86
44	0.86	1.04	1.24	1.45	1.69	1.94	2.21	2.49	2.79
45	0.84	1.02	1.21	1.42	1.65	1.89	2.15	2.43	2.73
46	0.82	0.99	1.19	1.39	1.61	1.85	2.11	2.38	2.67
47	0.81	0.98	1.16	1.36	1.58	1.81	2.06	2.33	2.61
48	0.79	0.96	1.14	1.33	1.55	1.78	2.02	2.28	2.56
49	0.77	0.94	1.11	1.31	1.51	1.74	1.98	2.24	2.51
50	0.76	0.92	1.09	1.28	1.48	1.71	1.94	2.19	2.46

The Strength of Cast-Iron Beams—Breadth one inch.

Len. in feet.	DEPTH IN INCHES.								
	19	20	21	22	23	24	25	26	27
	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.
1	136.98	151.78	167.34	183.66	200.74	218.58	237.18	256.53	276.63
2	68.49	75.89	83.67	91.83	100.37	109.29	118.59	128.26	138.31
3	45.66	50.60	55.78	61.22	66.91	72.86	79.06	85.51	92.21
4	34.25	37.95	41.83	45.91	50.18	54.64	59.29	64.13	69.16
5	27.40	30.36	33.47	36.73	40.15	43.71	47.43	51.30	55.33
6	22.83	25.30	27.89	30.61	33.46	36.43	39.53	42.75	46.11
7	19.57	21.68	23.91	26.24	28.68	31.22	33.88	36.65	39.52
8	17.12	18.97	20.92	22.96	25.09	27.32	29.65	32.06	34.58
9	15.22	16.86	18.59	20.41	22.30	24.28	26.35	28.50	30.74
10	13.70	15.18	16.73	18.36	20.07	21.85	23.72	25.65	27.66
11	12.45	13.80	15.21	16.70	18.25	19.87	21.56	23.32	25.15
12	11.42	12.65	13.95	15.31	16.73	18.21	19.76	21.37	23.05
13	10.54	11.67	12.87	14.12	15.44	16.81	18.24	19.73	21.28
14	9.78	10.84	11.95	13.12	14.34	15.61	16.94	18.32	19.76
15	9.13	10.12	11.16	12.24	13.38	14.57	15.81	17.10	18.44
16	8.56	9.48	10.46	11.48	12.55	13.66	14.82	16.03	17.29
17	8.05	8.93	9.84	10.80	11.81	12.86	13.95	15.09	16.27
18	7.61	8.43	9.29	10.20	11.15	12.14	13.17	14.25	15.37
19	7.21	7.99	8.81	9.66	10.56	11.50	12.48	13.50	14.56
20	6.85	7.59	8.36	9.18	10.04	10.93	11.86	12.83	13.83
21	6.52	7.22	7.96	8.74	9.56	10.41	11.29	12.22	13.17
22	6.22	6.90	7.60	8.35	9.12	9.93	10.78	11.66	12.57
23	5.95	6.60	7.27	7.98	8.72	9.50	10.31	11.15	12.03
24	5.71	6.32	6.97	7.65	8.36	9.10	9.88	10.69	11.53
25	5.48	6.07	6.69	7.34	8.03	8.74	9.48	10.26	11.06
26	5.27	5.85	6.43	7.06	7.72	8.40	9.12	9.86	10.64
27	5.07	5.62	6.19	6.80	7.43	8.09	8.78	9.50	10.25
28	4.89	5.42	5.97	6.56	7.17	7.80	8.47	9.16	9.88
29	4.72	5.23	5.77	6.33	6.92	7.54	8.17	8.84	9.54
30	4.56	5.06	5.57	6.12	6.69	7.28	7.90	8.55	9.22
31	4.42	4.89	5.39	5.92	6.47	7.05	7.65	8.27	8.92
32	4.28	4.74	5.23	5.74	6.27	6.83	7.41	8.01	8.64
33	4.15	4.60	5.07	5.56	6.08	6.62	7.18	7.77	8.38
34	4.03	4.46	4.92	5.40	5.90	6.43	6.97	7.54	8.13
35	3.91	4.33	4.78	5.24	5.73	6.24	6.77	7.33	7.90
36	3.80	4.21	4.65	5.10	5.57	6.07	6.58	7.12	7.68
37	3.70	4.01	4.52	4.96	5.42	5.90	6.41	6.93	7.47
38	3.60	3.99	4.40	4.83	5.28	5.75	6.24	6.75	7.28
39	3.51	3.89	4.29	4.71	5.14	5.60	6.08	6.57	7.09
40	3.42	3.79	4.18	4.59	5.01	5.46	5.93	6.41	6.91
41	3.34	3.70	4.08	4.48	4.89	5.33	5.78	6.25	6.74
42	3.26	3.61	3.98	4.37	4.78	5.20	5.64	6.10	6.58
43	3.18	3.53	3.89	4.27	4.66	5.08	5.51	5.96	6.43
44	3.11	3.45	3.80	4.17	4.56	4.96	5.39	5.83	6.28
45	3.04	3.37	3.71	4.08	4.46	4.85	5.27	5.70	6.14
46	2.97	3.30	3.63	3.99	4.36	4.75	5.15	5.57	6.01
47	2.91	3.23	3.56	3.91	4.27	4.65	5.04	5.45	5.88
48	2.85	3.16	3.48	3.82	4.18	4.55	4.94	5.34	5.76
49	2.79	3.09	3.41	3.74	4.09	4.46	4.84	5.23	5.64
50	2.74	3.03	3.34	3.67	4.01	4.37	4.74	5.13	5.53

The Strength of Cast-Iron Beams—Breadth one inch.

Len. in feet.	DEPTH IN INCHES.								
	28	29	30	31	32	33	34	35	36
	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.
1	297.51	319.12	341.52	364.68	388.56	413.25	438.65	464.85	491.80
2	148.75	159.56	170.76	182.34	194.28	206.62	219.32	232.43	245.90
3	99.17	106.37	113.84	121.56	129.52	137.75	146.22	154.95	163.93
4	74.38	79.78	85.38	91.17	97.14	103.31	109.66	116.21	122.95
5	59.50	63.82	68.30	72.93	77.71	82.65	87.73	92.97	98.36
6	49.58	53.19	56.92	60.78	64.76	68.87	73.11	77.47	81.96
7	42.50	45.59	48.79	52.09	55.51	59.03	62.67	66.41	70.25
8	37.19	39.89	42.69	45.58	48.57	51.65	54.83	58.11	61.47
9	33.05	35.46	37.95	40.57	43.17	45.92	48.74	51.65	54.64
10	29.75	31.91	34.15	36.47	38.86	41.32	43.87	46.48	49.18
11	27.05	29.01	31.05	33.15	35.32	37.57	39.88	42.26	44.71
12	24.79	26.59	28.46	30.39	32.38	34.44	36.56	38.74	40.98
13	22.88	24.55	26.27	28.05	29.89	31.79	33.74	35.76	37.83
14	21.25	22.79	24.39	26.05	27.76	29.52	31.33	33.20	35.13
15	19.83	21.28	22.77	24.31	25.91	27.55	29.24	30.99	32.79
16	18.59	19.95	21.34	22.79	24.29	25.83	27.42	29.05	30.74
17	17.50	18.77	20.09	21.45	22.86	24.31	25.80	27.34	28.93
18	16.53	17.73	18.97	20.26	21.59	22.95	24.37	25.82	27.32
19	15.66	16.80	17.97	19.19	20.45	21.75	23.09	24.46	25.88
20	14.87	15.96	17.08	18.23	19.43	20.66	21.93	23.24	24.59
21	14.17	15.20	16.26	17.36	18.50	19.68	20.89	22.14	23.42
22	13.52	14.51	15.52	16.58	17.66	18.78	19.94	21.13	22.35
23	12.93	13.88	14.85	15.86	16.89	17.97	19.07	20.21	21.38
24	12.40	13.30	14.23	15.19	16.19	17.22	18.28	19.37	20.49
25	11.90	12.77	13.66	14.58	15.54	16.53	17.55	18.59	19.67
26	11.44	12.27	13.14	14.03	14.94	15.90	16.87	17.88	18.92
27	11.02	11.82	12.65	13.51	14.39	15.31	16.25	17.22	18.21
28	10.62	11.40	12.20	13.02	13.88	14.76	15.67	16.60	17.56
29	10.26	11.00	11.78	12.57	13.40	14.25	15.13	16.03	16.96
30	9.91	10.64	11.38	12.16	12.95	13.77	14.62	15.50	16.39
31	9.59	10.29	11.02	11.76	12.53	13.33	14.15	14.99	15.86
32	9.29	9.97	10.67	11.40	12.14	12.92	13.71	14.53	15.37
33	9.01	9.67	10.35	11.05	11.77	12.52	13.29	14.09	14.90
34	8.75	9.38	10.04	10.73	11.43	12.15	12.90	13.67	14.46
35	8.50	9.12	9.75	10.42	11.10	11.81	12.53	13.28	14.05
36	8.26	8.86	9.48	10.13	10.79	11.48	12.18	12.91	13.66
37	8.04	8.62	9.23	9.85	10.50	11.17	11.86	12.56	13.29
38	7.83	8.39	8.98	9.59	10.23	10.87	11.54	12.23	12.94
39	7.63	8.18	8.75	9.35	9.96	10.59	11.25	11.92	12.61
40	7.43	7.97	8.53	9.11	9.71	10.33	10.96	11.62	12.29
41	7.25	7.78	8.33	8.89	9.47	10.08	10.70	11.34	11.99
42	7.08	7.59	8.13	8.68	9.25	9.84	10.45	11.07	11.71
43	6.92	7.42	7.94	8.48	9.03	9.61	10.20	10.81	11.44
44	6.76	7.25	7.76	8.29	8.83	9.39	9.97	10.56	11.18
45	6.61	7.09	7.59	8.10	8.63	9.18	9.74	10.33	10.93
46	6.46	6.93	7.42	7.92	8.44	8.98	9.53	10.11	10.69
47	6.33	6.79	7.26	7.75	8.26	8.79	9.33	9.89	10.46
48	6.19	6.64	7.11	7.59	8.09	8.61	9.13	9.68	10.25
49	6.07	6.51	6.97	7.44	7.93	8.43	8.95	9.48	10.04
50	5.95	6.38	6.83	7.29	7.77	8.26	8.77	9.29	9.83

NATIONAL ACADEMY OF DESIGN.

REVIEW OF THE EXHIBITION.

The limited space devoted to this subject in the last number, compelled us to pass by unnoticed, many pictures in the collection deserving comment. These omissions we here endeavor to supply; and if not to the fullest extent desirable, they are yet enough, it is believed, to render the review impartial.

62. *Nuns at Devotion.* Wm. Havel. This composition is very creditable, and in some parts reminds us strongly of Alston's Vision of the Bloody Hand. The moonlight effect is closely copied from nature, and free from the leaden tone so usual in pictures of this class. The warm tones, from the raised lamp falling on the faces of the suppliant nuns, are effective and imposing.

79. *Group of Children.* T. P. Rossiter. This artist has evidently a good eye for color, but has been careless in the drawing of his picture. The right arm of the infant, from a wrong disposition of it, appears cut off near the shoulder: the left arm of the elder girl is also extremely faulty. It is to be regretted that so much talent as this artist possesses, should be almost wholly lost, from want of care in drawing. It is as impossible to make a good picture with bad drawing, as to build a good house on a bad foundation, or to read a language without knowing its alphabet.

88. *Group of two young Girls.* G. C. Bingham. An effort without success.

91. *Portrait of a Lady.* F. R. Spencer, A. The head is beautifully painted and highly finished. A want of definiteness at the ends of the fingers much injures the picture.

108. *Portrait of a Lady.* J. H. Shegogue. A most spirited portrait, and strongly characteristic of the artist. We cannot account for the fact that this gentleman, whose talents and private worth have procured for him the friendship of all who know him, should not have received the honors of the Academy. If he has declined to receive what his rank as an artist fairly entitles him to, we fear he has mistaken both his interest and

his duty : if the Academy has refused to award its honors to such talents as Mr. Shegogue possesses, we should fear that the private jealousy of some less worthy artist has induced the rejection.

109. *Landscape.* J. Talbot. An unobtrusive, sombre, and true picture.

116. *Murder of the Innocents.* W. J. Bolton. A most daring attempt, and not without success. The slight faults of drawing are almost excused, in so young an artist, by the boldness of the composition.

117. *Fruit Piece.* A. J. Oliver, A. R. A. Beautifully painted : the subject not worthy the effort.

121. *Portrait of Master Baker.* W. H. Powell. Free, happy and unfinished. This young artist has evinced great talent. The *keeping* of his pictures does him credit ; but, if we mistake not, he would do well to be more definite in minutiae, and not trust entirely to *general effect* for excellence.

122. *Portrait of a Lady.* J. W. Audubon. The drapery is well painted ; the flesh is rather chalky in the high lights, and the shadows are russet toned : the picture is wanting in pearly half tints.

127. *Portrait of a Lady.* E. Mooney, A. A promising effort. The flesh is clear and good.

129. *Portrait of a Gentleman.* H. Inman, N. A. This picture contains one of this artist's peculiar excellencies ; we refer to the well-chosen style and action of the figure, which fully entitle it to the character of a composition. The artist who chooses a classical position and arrangement for his sitter, produces a pleasing as well as correct likeness. Perhaps there can exist no better proof of the acknowledged excellence of Mr. Inman's productions than the fact that all who have attempted to tarnish his fame have been foiled. His portraits, from their high character, have literally defied criticism.

137. *Full-length Portrait of a young Lady.* Miss J. Stuart. A bold attempt, with much success.

143 and 216. *Portraits.* S. A. Mount, A. Mr. Mount has made rapid strides toward a consummation of the wishes of his friends. His early still-life pictures will be long remembered

for their faithful accuracy, and his portraits of this year are boldly drawn and truly colored.

148. *Portrait of a Gentleman.* J. Mins. A quiet, good portrait.

153. *Portrait of E. Ranger, Esq.* H. Inman, N. A. Perhaps no subject could have been chosen so well adapted to the peculiar powers of this artist. Those who have witnessed Mr. Ranger's dramatic personifications, cannot but be surprised at the accuracy with which Mr. Inman has embodied *all* his peculiarities. It is a speaking likeness.

175. *Portrait of a Gentleman.* J. E. Freeman, N. A. The left side of this head is finely colored; the right side is without keeping, and consequently produces a want of rotundity and relief, not excusable in a picture containing so many other good points.

180. *Portrait of a Lady.* R. Boyle. Carefully copied from nature, and only requires warmth to complete its excellence.

197. *The New Story.* J. L. Morton, N. A. Well composed, and studiously correct in drawing. The disposition of light and shade is worthy of imitation.

199. *Fourth of July in the Country.* C. Deas, A. Highly characteristic in all its details. The negro in the fore ground is an exact representation of chivalric feeling as produced by brandy.

204. *Landscape.* W. M. Oddie, A. Mr. Oddie is an amateur artist, and produces pictures that would do credit to many professionals. This picture is nicely pencilled, and in excellent keeping.

209. *A Member of the Highland Society in the tartans of his native clan.* J. Linen. A beautiful cabinet picture: the head is particularly fine. Those who have seen the head of the Hon. Henry Clay, by this artist, can fully appreciate his merits.

242. *The Blackberry Girls.* W. S. Mount, N. A. In this picture the artist has departed from his usual style of coloring, and produced (if possible) a more pleasing composition than formerly. The accessories are copied evidently from nature; and the healthy, florid complexion of the principal figure added to the happy delineation of her joy at her success, makes the picture truly interesting.

258. *Portrait of a Lady.* *E. D. Marchant, A.* This artist has been some time absent from the city, and evidently has not been idle. It is vastly an improvement over his former works, of which we have before spoken in high terms. We understand from those who have visited his studio, that he has many pictures far superior to this, which is bestowing the highest praise.

259. *The Appointment.* *S. A. Mount, A.* A composition of no ordinary merit: it is lively, sparkling, and playful. Mr. Mount is truly a lover of his art, and will doubtless attain a rank in the profession commensurate with his desires.

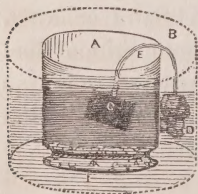
266. *Portrait of a Lady.* *C. C. Ingham, N. A.* We can only reassert the inadequacy of language to do justice to this artist's female portraits.

306. —————. Not on the catalogue, and should not have been in the exhibition. It is positively unworthy a place on the walls.

The exhibition has, throughout, been well attended; and it gives us pleasure to be able to add that it has in all respects been highly satisfactory to the friends of the Academy.

ELECTROTYPE COPIES OF MEDALS, COPPER PLATES, TYPES, &c. &c.

We are happy in being able to present our readers with two impressions from copper-plates: the first is from the original engraved plate; the other, from an electrotype copy made by Dr. Chilton, which will be found in every respect fully equal to the original. The cost of such plates will not exceed that of the plain plate before being engraved. This is the first electrotype plate printed from in this country; and, so far as we can learn, is much larger than any made in Europe.



The annexed cut fully illustrates the operation. B is a wooden vessel, open at the top; A, a glass cylinder, closed at the lower end by a piece of bladder; C, the engraved plate to be copied; D, a piece of zinc; E, a wire or strap of copper attached to C and D.

A should be partly filled with a saturated solution of sulphate of copper, and B with very dilute sulphuric acid, (say 100 water to 1 acid) to the same level as the solution in A. The parts of C not required to be covered with copper, should be coated with wax or varnish, to prevent the precipitate from adhering. The sulphuric acid mixture in B should receive fresh acid from time to time; and a small bag containing crystals of sulphate of copper should be suspended in A, by which means the solution of sulphate of copper will remain saturated. After two days, metallic copper will have precipitated on the plate to a sufficient thickness for removal. Dr. Chilton advises that the precipitated side should be laid on a flat piece of hot iron, and the original plate to be covered with a slab of cold marble: by this means, the expansion of the precipitate will relieve it from the original, and facilitate its removal. We thus have a copy with raised lines, which must again be subjected to the bath; the second precipitation being like the original, and capable of receiving ink and giving impressions.

As a general rule, it is advisable to clean the surface of the original plate, so as to remove the oxide, if any be formed. Plumbago of a fine quality should then be applied, which will materially assist in removing the precipitated electrotype.

Mr. W. A. Cox has succeeded in precipitating iron in a metallic state, from sulphate of iron, (the copperas of commerce.) This was the result of an experiment undertaken only to test the practicability of obtaining a metallic precipitate from that cheap salt of iron. The precipitate was formed upon a piece of stereotype plate, and had about the same relative brittleness as precipitated copper: the aggregation was perfect, the adhering surface highly polished, and the plate was readily acted upon by magnetism. The trial was conducted in a common glass tumbler, with a baked plaster partition dividing it into equal compartments, and secured to the sides and bottom by casting plaster, which was mixed with water and poured into the joints, making them water-tight. This forms a neat and economical apparatus for experimental researches of that nature. Within the last week, the matrices used by type-founders have been duplicated with entire success. In a suc-

ceeding number, we shall print a page from copper type made by precipitation, and continue to give hereafter such specimens as will best show the advancement of this discovery.

Copies may be taken from plaster, wood, paper, &c. by covering the surface to be precipitated upon with plumbago; and it is not improbable that a copper-plate could be made by precipitating upon the surface of an impression on paper, if the ink were boldly raised and the surface covered with plumbago.

This process is equally applicable to making watch and clock dials, coating of iron vessels with copper; and, indeed, there is scarcely any department of art in which it may not be rendered useful. The discovery has scarcely left the germ; and yet enough has been done to induce the belief that it will become one of the most important results of modern scientific investigation. If mechanical ingenuity needed an incitement to activity in making this invention of more general value, the strongest might be found in its brief history.

IMPORTANCE OF MECHANICAL INSTITUTIONS.

This age has been the witness of a struggle by the mechanic arts for their true position in society. They have asserted their right to hold a place high in the esteem of mankind, and have supported the claim to this right by proofs the most indisputable. They have combated the error which denied justice to them, by repeated demonstrations of their worth, until released from the thralldom imposed by ignorance and prejudice, they have walked abroad in their strength, the acknowledged adjuncts of science, and best benefactors of mankind.

Nor has their advancement in usefulness been the less for this elevation of character. At no period within their known history has the progress of the mechanic arts been more rapid than since the commencement of this century. They have improved and rendered more efficient every material help to the dissemination of knowledge. They have connected parts of the globe the most distant from each other, by applications of a power that almost annihilat^e time and space. They have rendered doubly valuable to man, many products of the earth

and ocean, and have subjected to his use the most powerful and subtle agent in nature.

As assistants, and perhaps the ablest in producing these results, may be considered mechanical institutions. The greatest facilities are afforded by these associations to the members, for the acquisition of knowledge pertaining to their occupations or pursuits: extensive libraries, selected with reference to the nature of the society; reading rooms; museums of inventions; lectures upon all subjects connected with the useful arts; collections of mechanical and scientific apparatus; and frequently, cabinets of minerals, or collections of other specimens illustrative of natural history; the formation of classes for mutual instruction upon subjects of interest; and above all, an intercourse with those of similar tastes and pursuits. An independence of thought and action is fostered by this contact with their fellows; error is more readily detected; reliance upon their own energies strengthened; and the mental powers developed and encouraged by comparisons unconsciously drawn.

It might be shown that the beneficial effects of these institutions extend to all classes of society—that their influence is felt in every grade of a community where they are established. It is not our intention at this time, however, to do more than set forth the direct benefits they confer—the advantages derivable from them by members, their apprentices and families. In schools established under their auspices and direction, children are instructed in such branches of learning as will fit them for a career of usefulness in after life. Much of the lumber of modern education is avoided, and the scholar, after the usual period of study, leaves the seminary with an acquisition of knowledge that may truly be termed valuable.

To the apprentice, these associations offer advantages incalculably great. He may, at a trifling expense, during the leisure hours of his apprenticeship, obtain a knowledge of every thing valuable in science and art connected with the trade that is to be his future means of support; and when he leaves his minority, he does it, if he has rightly employed the time, possessed of the experience of all who have been eminent in his own call-

ing or pursuit. He starts upon an equality, save in the application of his knowledge, with many of his compeers who have devoted half of their lives to the business ; he has acquired that which is to him more than wealth ; and, far better, has avoided those frivolities and pleasures that too often prove the grave of mind.

Associations of this description have sprung into existence wherever the useful arts are fostered ; and in some countries the governments, with an enlightened policy, encourage their formation by the bestowal of peculiar privileges. Their fairs and exhibitions are very justly considered the nurseries of excellence in the mechanic arts. Europe possesses several hundred mechanical associations—some of great celebrity ; and since utility has become a merit, the highest and noblest of the land have deemed it an honor to participate in the public celebration of some event or epoch connected with them. In Great Britain, where the manufacturing or mechanic interests predominate, these institutions surpass all others in number and usefulness. They are found in every town or district where any considerable part of the population depend for support upon the arts and trades ; conducted always with the greatest liberality, and sometimes bestowing a silent reproof upon their more exalted co-laborers, by establishing departments for advancing the science of agriculture, civil engineering, and other branches not embraced in their original plans.

In our own country, with feelings of proud satisfaction we record it, mechanical associations embrace the most extended sphere of usefulness, and take a rank not inferior to any other institutions of the land. They are endowed with the comprehensive and active spirit of a people who deem nothing done while aught remains undone. They foster equally, and in the most effective manner, the many interests arising from an immense territory, yielding most of the products of the globe. To advance and improve the practical mechanic, is the first care of these associations ; yet men of all professions and pursuits are admitted to a participation in their advantages ; and while carrying out the objects of their formation, they yield the greatest encouragement to philosophy and the sciences, since a

knowledge of most or all of these has become necessary to complete success in mechanical pursuits.

It is a frequent remark, yet true as oft repeated, that although in our infancy as a nation, the useful arts with us have attained the strength and vigor of manhood ; that we are in this particular equal in the race for distinction with that country, eminent for her arts and manufactures, from which we derive our origin. Nor is this to be wondered at : the spirit of the nation is decidedly utilitarian ; and our arts, more than our arms, have made us respected abroad and admired at home. The excellence of our naval architecture alone has done more for the character and enterprise of Americans in the old world, than the eloquence or political talents of any statesman now living. The late Sultan of Turkey paid us a high but deserved complement, when he said that “ America must be a great country, to *spare* such a man as Henry Eckford.”

PERKINS'S STEAM-GUN.

This splendid piece of mechanism, which has so long been the wonder of Europe, has at length arrived in New-York, and fully sustains all the fame it has secured to the inventor. In our next number we shall give a detailed account of the arrangement, with illustrations. In the mean time, we would advise our mechanics to visit the exhibition, corner Broadway and Chambers street.

LETTER FROM DR. WALLACE.

No. 90 Chambers Street,
New-York, 18th June, 1840. }

DEAR SIR :—

In reply to your questions concerning the animalcule in the eye of the horse mentioned in the last number of the Repertory, I beg to state that animalcules in the eyes of man and other animals have been repeatedly witnessed ; but I have never read of a case where the animalcule was of such a length, or the motions so lively, as that now exhibited in the horse.

The animalcule could be very easily removed by cutting into the eye, and drawing it out with a pair of small forceps, if its removal were of advantage.

The origin of these animalcules is involved in obscurity.

Truly, yours,

W. C. WALLACE.

J. J. MAPES, Esq.

We acknowledge the receipt of the Report on A. M. Perkins's Patent Steam-Boiler, by Josiah Parkes, Esq. through the Hon. Daniel Webster. It shall be attended to in our next.

TO THE READER.

It is proper that the conductor of a public journal should, at fitting intervals, lay aside the reserve which shrouds the craft, and address himself familiarly to the reader, upon the subject which forms the bond of union between them. This number, as you are aware, completes the first volume; and we trust you have found the work in no wise to have failed in redeeming its prospective promises, except that of punctuality. The best palliative we have to offer for this omission is the *newness of the machine*, which scarcely yet moves easily in its bearings. This difficulty, though for the time unpleasant, must necessarily be of short duration, and will ere long cease to exist—meanwhile, we trust, the '*duty*' will have been doubled.

THE EDITOR.

CORRECTION.—At the request of our correspondent "L." we publish the following:

In our remarks on Professor Torrey's Botanical Report of the Geological Survey of the State of New-York, for the past year, we incidentally animadverted upon the exclamation points appended to some of the names and authorities. Since then we have learned that they are employed to designate such specimens as the author himself has examined. Under these circumstances, we owe an apology to Dr. Torrey, which we most cheerfully make; though, at the same time, it is due to ourselves to state that for want of an explanatory note, it is an error into which many others have also fallen.

L.

PROGRESS OF THE MECHANIC ARTS.

On the Nemesis private-armed Steamer, and on the comparative efficiency of Iron-built and Timber-built Ships. By AUGUSTIN F. B. CREUZE, of H. M. Dock-yard, Portsmouth.

Most persons who take any interest in naval affairs will have observed, for some years past, occasional notices in the newspapers, of boats and vessels built of iron. It appears to be very probable that this material may eventually almost wholly supersede timber in the construction of boats, barges, steam, and the smaller classes of sailing vessels; and therefore any information as to the manner of building such craft, or on their qualities, and the comparative increase either of safety or danger, by the substitution of iron for timber, must be worthy of notice. The *Nemesis*, a steam-vessel of nearly 700 tons burthen, and built wholly of iron, has been lately docked at her Majesty's Yard, at Portsmouth, for the purpose of having damages repaired, which she had sustained by striking on a rock off Scilly, in thick weather, when on her passage from Liverpool to Odessa. This afforded a most favorable opportunity of obtaining considerable insight into the details of an iron vessel, while the courteous anxiety displayed by the gentleman who built her, Mr. Laird, of the Berkenhead Iron Works, at Liverpool, and by the officer, Mr. Hall, a Master in the Royal Navy, who commands her, to give every information that was in their power, removed all the difficulties which generally attend such a task. The following particulars, as far as facts are concerned, may therefore be relied upon as correct: the opinions which may be intermingled with those facts must, of course, be received only as such. The dimensions of the *Nemesis* are as follows:—

Length between the perpendiculars, feet.....	165
Length over all	184
Length from stem to taffrail.....	173
Breadth	29
Depth	11
Burthen (old measurement) tons.....	660

The keel-plate was laid in August of the last year; the vessel was launched in November; her engines put on board, and she herself tried in December; and, finally, she was ready for sea by the middle of January.

The vessel is built almost entirely of iron; the exceptions being the planksheer or gunwale, which is of oak 4 inches thick and 10 inches broad, brought upon and secured to a planksheer or gunwale of angle iron; the flat of the deck, which is of 3-inch fir; four beams under the deck, 9 inches square. These are forward, and support the carrick-bitts, paul-bitts, and the foremost gun. The remainder of the beams, with the exception of the paddle-beams, which are of oak, 12-inch sided and 14-inch moulded, are of iron. The knee of the head, the rudder, the paddle-boxes, and a light berthing above the gunwale, about 2 feet 8 inches high, are of wood. The coamings and fittings upon deck are generally of wood, although for these purposes more iron is used in the *Nemesis* than in timber-built vessels. The cabins and fittings for the officers, passengers and crew, are of wood, and are very neat and handsome.

The mean launching draught of water—with masts, yards, rigging, anchor, and cable, with the cabin fittings in a forward state—was, according to the information afforded by Mr. Laird, 2 feet $4\frac{1}{2}$ inches. The mean load draught, with 12 days' full supply of coals, water and provisions, for a crew of 40 men for 4 months, and 3 years' ship stores of all sorts, with duplicate and extra machinery, is also stated to have been 6 feet.

The engines were made at Liverpool, by Messrs. Forrester & Co. The diameter of the cylinders is 44 inches, and the length of the stroke 4 feet. The estimate in horse-power for the two engines is 120. The framings or supports for the engines are of wrought iron. It is usual to have them of cast iron. The greater strength of wrought iron enables them to be made of much less size and weight, and their appearance is also necessarily lighter. The boilers may be worked either separately or together. The paddle-wheels are 17 feet 6 inches diameter to the inner edge of the rim. The floats, which are 16 in number, are 6 feet 9 inches long, and $14\frac{1}{2}$ inches broad. The paddle-shaft is 78 feet abaft the fore-end of the water-line. The vessel carries two 32-pounder medium guns, one forward and the other aft, on pivot-carriages, to fire over all; and it is this which constitutes one of the chief points of interest in the *Nemesis*. The guns are reported to have been fired several times with an extra charge of powder, and double-shotted. The concussion has left no visible traces on the vessel; and, the experiment, as far as it has as yet been carried, certainly does not militate against the adoption of iron in the construction of ships for war.

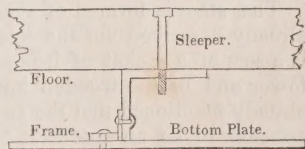
The fore-mast rakes 2 feet in 20, and is 32 feet abaft the fore-end of the water-line. The main-mast rakes 1 foot in 20, and is 111 feet 6 inches abaft the fore-end of the water-line. The bowsprit steaves 5 feet 6 inches in 20 feet. The following are the dimensions of the spars :

	Length, ft.	Diameter, in.
Fore-mast, from deck to hounds	42	15
Fore-mast, from head	8	—
Main-mast, from deck to hounds	$42\frac{1}{2}$	15
Main-mast, from head	8	—
Fore top-mast	24	10
Fore head	4	—
Sliding gunter-mast	28	6
Sliding pole	8	—
Main top-mast	33	10
Main pole	13	—
Fore gaff	23	$7\frac{1}{2}$
Main gaff	23	$7\frac{1}{2}$
Fore-yard cleated	52	} $10\frac{1}{2}$
Fore-yard arms	3	
Fore topsail-yard, cleated	36	} $8\frac{1}{2}$
Fore topsail-yard arms	2	
Fore topgallant-yard, cleated	25	6
Fore topgallant-yard arms	$1\frac{1}{2}$	6
Bowsprit, out-board	21	15
Jib-boom, out-board	13	8
Jib-boom, in-board	$13\frac{1}{2}$	—

The form of the midship section may be best described by saying that it is an oblong, 11 feet in depth and 29 in breadth, with its base curved downwards 6 inches in 15 feet, to the middle line of the keel, its sides slightly curved outwards, and the lower corners rounded off in the arc of a circle to a radius of about three feet. The midship portion of the body, in which the engines, boilers and coals lie, preserves much the same section throughout its length. Forward and aft, the form becomes finer, and gradually approximates to the usual bow and stern of sailing vessels. The stern-post is plumb. The stem rakes forward of the perpendicular at an angle of 16° . It may here be remarked, that the body is throughout remarkably fair; and that an observer, standing either before the stem looking aft, or abaft the post looking forward, can detect no more difference, if any there be, between the two sides, than would be observed in a vessel built wholly of wood.

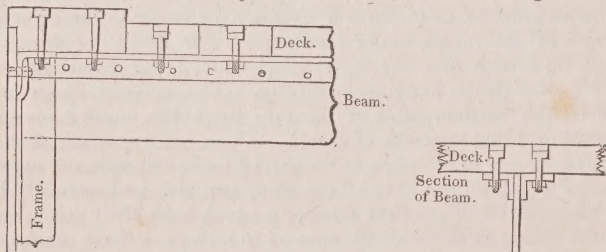
With respect to the method of connecting the various parts, strictly speaking there is no keel, although the lower plate of iron, which connects the two sides of the ship, and which is about a foot in breadth, is called the keel-plate. This plate is slightly curved, with its convex side downwards, so as to form a channel for water in the direction of the length of the vessel, under the floors. The floors are straight bars of angle iron, with one flange, 4 inches wide, lying horizontally; the other 9 inches deep, hanging vertically. The vertical flange is connected to the bottom-plates of the ship by 3-inch angle iron—that is, angle iron of 3 inches width of flange. Upon the upper surfaces of the floors, five ranges of sleepers, of timber 12 inches square, and extending the whole length of the hold of the ship, are laid, and securely bolted to the horizontal flanges of the floors, by 1-inch bolts, their points secured under the flange of the floor by nuts on to screws at these points. The frames, which are of angle iron 3 inches wide, are 18 inches apart along the midship body of the vessel; but forward and aft this space is gradually increased, until they become about three feet apart. The in and out flange of the frames is riveted to the vertical flange of the floors by $\frac{3}{4}$ iron rivets, about 6 inches apart. The iron plates forming the planking, or rather skin, of the vessel, are secured to these frames by being riveted to the other flange of the frames with rivets of $\frac{3}{4}$ iron, which are distant apart about 3 inches from centre to centre.

The connection of the sleepers or keelsons, which are of red-pine timber, with the iron floors, and of the floors with the frames, and of the iron plates with these frames, may be more easily understood by the accompanying sketch. The rivets by which the plates are secured to



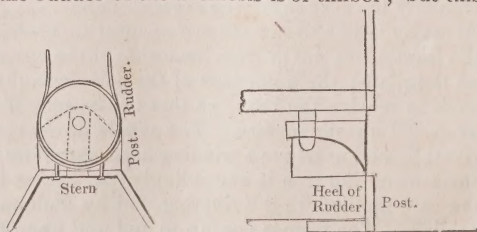
the frames, are put in from the inside of the vessel, and are clenched flush on the plate; the outer part of the hole through the plate being counter-sunk to receive the rivet, so that the bottom of the vessel is a perfectly even and smooth surface. The whole of the riveting is performed with rivets heated nearly to a welding heat; therefore, the contact between the surfaces of the iron is exceedingly perfect, as it is insured not only by the care applied to the riveting, but by the contracting of the rivets in cooling. The frames run up to and end upon the iron gunwale, which

has been before mentioned. This is of 3-inch angle iron, with one flange horizontal, to which the 4-inch wooden gunwale is secured by screw-bolts; the other flange is vertical, and to that the upper ends of the frames are riveted. Between the wood and the iron forming this compound gunwale, felt is laid, which is so firmly compressed by the screw bolts, that the joint is perfectly water-tight. The beams are of iron, and formed by two bars of angle iron, having their vertical flanges back to back, with a bar of iron 9 inches deep and $\frac{1}{4}$ of an inch thick riveted between these two vertical flanges. The deck is of fir, 3 inches thick, lying upon and being secured down to the horizontal flanges of the beams by screw bolts, the heads of which are sunk about $\frac{1}{2}$ an inch below the surface of the plank, and are hidden by plugs driven down upon them with white lead. Thus the fastenings of the deck are scarcely perceptible. The points of these bolts are secured beneath the horizontal flanges of the beams by nuts on a screw. The connection of the angle-iron gunwale with the wooden gunwale and with the planking; also, the connection of the deck with the beams, and the method of forming the beams, will be more easily understood by the following sketches:



The ends of the beams are secured to the sides by angle-iron knees. The paddle-beams, which, it has been before said, are of timber, pass the sides of the vessel through what may be called sockets, formed by bars of angle iron placed above, below, and on each side of them. One flange of each bar is firmly riveted to the planking of the vessel; and the other flange is secured to the beam by screw bolts. Felt is also inserted here in the joints between the wood and iron. This appears to be a general precaution in similar connections.

The stem is formed of sheet-iron, in the same manner as has been already described for the keel. At the lower part of the stem there is a sort of a socket of iron, which forms the gripe, and in which the lower end of the wooden knee of the head is inserted. It has been already mentioned that the rudder of the *Nemesis* is of timber; but this appears to be an exception to the general practice in these iron vessels. The main piece inclusive of the head, is usually of iron; and when of iron, is thus formed and connected with the stern-post.



The stern is strengthened by a fashion-piece of angle iron; and the tie across the stern is by a transom, also of angle iron. The berthing all round the vessel, already mentioned as being of fir, is secured to short top-timbers of wood, which are let through the gunwale and run down about two feet below it. They are secured by two riveted bolts through the planking of the vessel; and at their intersection with the iron gunwale, by angle iron on each side.

The sheets of iron which form the planking of the vessel are about 8 feet long and 2 feet 6 inches broad. Of course, these dimensions vary according to the place of the sheet in the body of the vessel. The lower 6 strakes which form the bottom, and extend from the keel-plate to the turn of the bilge, are clinker-built. The strake at the turn of the bilge, and the 5 strakes which form the side of the vessel from this turn upwards, are carvel-built. The lands of the clinker seams are riveted with $\frac{3}{4}$ iron rivets similarly to the lands of a clinker-built boat, without any strengthening bands. The carvel seams, and the butts of both clinker and carvel strakes, are secured by bringing the edges of the plates in contact, and riveting each edge to a strip of plate-iron, lying on and lining the inside of the joint. The seams are caulked by closing the edges of the two plates together with blows of a cold chisel. The whole of the rivets are flush on the outside of the vessel. The keel-plates are 7-16ths of an inch in thickness. The clinker-worked plates covering the bottom of the vessel are $\frac{3}{8}$ ths of an inch in thickness; and the carvel-worked plates, covering the top-sides, are from 5-16ths to $\frac{1}{4}$ of an inch in thickness. The iron work is first painted with several coats of red lead, and then varnished with a patent varnish. This covering to the iron did not appear to be at all disturbed on any part of the bottom excepting where it had been rubbed off by the rocks on which she had grounded.

There are several peculiarities in the internal arrangements of the vessel. The whole internal space is separated into seven water-tight compartments, by six iron athwartships bulkheads.* Four of these—those in the wider part of the vessel—are of 5-16ths of an inch iron. The bulkhead nearest to each extremity, being of small surface, and liable to less immersion, is only 3-16ths in thickness. The wooden sleepers necessarily pass through each of these bulkheads, and they are secured where they pass through by strong flanges bolted down to them over felt, and riveted to the bulkheads, so that no water can possibly pass from any one compartment to the other. Therefore, a leak which may be sprung in any part of the bottom of the vessel, can only affect that compartment between the bulkheads of which it happens. Thus the damage caused by the rock on which she struck, admitted 4 feet of water into the compartment in which it occurred, before the leak could be stopped, but there was none in any other part of the vessel. There is a small hand-pump fitted to each compartment, the pipe from which leads into the hollow of the keel-plate. Large pumps are not

* We have been told that this method of dividing the whole length of a vessel into separate water-tight compartments is adopted in all sea-going Chinese junks. We trust our naval men engaged in those seas will keep their eyes open to these and many other interesting particulars respecting the Chinese vessels—for a description of which our pages shall always be open.—Ed.

necessary, as the compartment can only fill to the level of the external water, and may then be emptied at leisure; or, if the leak be greater than the discharge of the pump, may remain filled until a port is reached.

In the space between the engines and the boilers, usually called the stoke-hole, there is a very ingenious means adopted to strengthen the body, without interfering with the accommodations of the engine-room. This is the introduction of a partial bulkhead with an aperture bounded above by an erect, and below by an inverted arch of bar-iron; thus supplying by mechanical contrivance the support which otherwise could not be obtained for this part of the body, without great inconvenience. To obviate the disadvantages attendant on the small draught of water which this vessel draws, there are two sliding keels, similar in principle to those which were originally proposed by Capt. Shank, of the Royal Navy, when in command of the British force on the American Lakes, during the War of Independence. These keels are each 7 feet long, and capable of being protruded 5 feet below the keel of the vessel. They are of wood, $4\frac{1}{2}$ inches thick, and each works up and down by means of a small windlass and an endless chain, in a water-tight case or trunk 12 inches wide, formed, like the rest of the bulkheads, of sheet iron, and running from the bottom of the vessel up to the deck. The plates of these trunks are $\frac{7}{16}$ ths of an inch thick, and they are strongly secured by angle iron to the athwartship bulkheads, which they also serve to support.

The report of the officers on the advantage which they derived from these keels, when under sail, in enabling them to keep the vessel up to windward, and in keeping her steady, is very favorable. In fact, they are an ingenious modification of the lee-board. One of them is situated just before the engine-room, and the other just abaft it. There is also a contrivance by which the depth of the rudder in the water may be increased whenever these sliding keels are used.

Having now described the vessel, we will proceed to describe the damage she sustained by striking. When she struck, her speed is reported to have been nearly 9 knots: her average speed was $8\frac{1}{2}$. The first blow was evidently received exactly in the centre of the front of the fore-foot or gripe, which was dented in about 3 inches, and split about 8 inches in its length. This blow must have been inflicted by a rock at least as sharp as the pea of a moderate sized anchor. The blow appears to have been repeated under the keel-plate, about 7 feet abaft the fore-foot, but there it only occasioned a slight, though long indentation. The principal damage was on the starboard side under the bilge, and at the station of the foremost bulkhead. The outside plate or planking was cut through by the blow having forced it on to the edges of the bulkhead plates; and the lower plate of the bulkhead was broken by this pressure. The wooden sleeper, which lay on the iron floor almost directly above the blow, was started up $1\frac{1}{2}$ inches from off the floor, and the iron bolt which secured it to the floor was broken.

The blow, to have produced such damage as has been described, must evidently have been very severe. It apparently clearly establishes that the injury affects the part struck only, for the rivets seem to have held as tight, and the contiguity of the plates of iron to have remained

as perfect after the blow as before it had occurred, excepting only the plates cut by the bulkhead. There might have been a very rational doubt, before the experience this accident has afforded, whether, under such an injury, sheets of iron would not have rent almost as sheets of paper would tear; and whether the rivets would not have started by the dozen at a time, as the stitches in the seams of a sail. Several of the plates abaft the cut plates were indented in a long wavy indentation. The greatest depth of the indentation occurred at the cut, where it was $3\frac{1}{2}$ inches.

The injuries were repaired by placing a shoe over the fore foot, somewhat similar in shape to the shoe used to drag the wheel of a carriage when going down hill. This shoe was riveted strongly, by rivets passing through it and the gripe, from side to side. The two plates of the bottom which were cut, and the plate of the bulkhead which was broken, were taken out by punching out the rivets, and new plates were substituted for them. Those plates which were only indented were taken out, straightened in the fire, and replaced. A small quantity of the angle iron framing, connecting the bulkhead to the bottom, was also removed, and substituted by new. According to information afforded by Mr. Laird, the weight of new materials used in the repairs was under 3 cwt. and the expense for the materials, and wages of the smiths and riveters, about £30; which, he says, would have been diminished to £20, if he could have had the facilities that are afforded by his own factory.

It is not easy to institute any comparison between the expense of this repair and that of a similar accident to a timber-built ship; because we cannot ascertain what would have been the extent of the damage. If any timbers had been broken, which would in all probability have been the case, the expense would have been much greater. But unless timbers had been broken, the mere upsetting of the gripe of a ship, the rubbing off of a few sheets of copper, and the shifting of a plank or two, would not have involved expense much exceeding that of the repair of the *Nemesis*.

Before the vessel was grounded upon the blocks, sights were placed towards each extremity, 140 feet apart, with a third sight between them. By means of these sights, observations were taken before and after grounding, and the deviation from the straight line, in the length of 140 feet, was only a quarter of an inch.

Two questions now naturally arise:—1. What are the advantages or disadvantages of the substitution of iron for timber in the construction of ships?—2. To what limit may this substitution be advantageously carried? Among the advantages are the employment of a less costly material, of which the supply is inexhaustible, and for which supply we are totally independent of other nations. Also, the greater durability of the material, not only arising from its relative durability with that of timber, but from its requiring no metallic sheathing to protect it from the ravages of worms. Also, the greater durability of the structure as a whole, in consequence of the greater permanency in the perfect combination of its several parts, arising from the fastenings being of the same hardness of texture as the portions of materials brought into connection. The metallic fastenings to a timber-built vessel act, it must be

remembered, not only chemically but also mechanically, to accelerate her destruction, immediately the close connection of the several parts is at all diminished.

These appear to be the principal advantages of iron in connection with the question, as far as first expense of material and durability are concerned. But these considerations are independent of the expense in relation to the comparative total quantities of materials required to build a ship of each sort. For it must be remembered that the iron-built vessel is of iron alone; the timber-built vessel is of timber, iron, and copper.

Were it possible to compare an iron-built ship with one entirely built of timber, setting aside the question of durability, undoubtedly the advantage would be wholly on the side of the timber-built ship. For the strength of oak is one-fifth that of wrought iron, and its weight is only one-eighth that of wrought iron. But this comparison is untenable, because of the great quantity of metal which necessarily enters in the construction of the timber-built ship, by which its relative weight is very much increased, and its relative strength diminished. By the term "timber," in speaking of a timber-built ship, a compound of timber, copper and iron is meant, having less strength in proportion to weight than the timber alone, but greater weight in proportion to strength. It is impossible within the limits of this paper to investigate the actual weights of wood, iron, and copper, which enter into the composition of a timber-built ship, in order to ascertain the exact answer to the question as to which is the heavier material in proportion to its strength, the "timber" of the timber-built ship, or the iron of the iron vessel. We shall, however, assume as correct that which we believe would be found to be so, viz. that the material of the timber-built ship would be the heavier in proportion to its strength, and shall proceed to the further investigation of the original questions on that assumption. Therefore, by the substitution of iron we obtain equal strength with less weight of material. From which advantage it follows, that if the "timber" and the iron vessel be each built for the same loaded displacement, the iron vessel, with equal strength will be capable of carrying a heavier cargo, and with greater strength an equal cargo. Also, that if a "timber" and an iron vessel be built of the same strength, and to carry the same weight of cargo, the iron vessel may be of less displacement, and consequently smaller in dimensions, or if of less displacement with the same dimensions, may be more advantageously formed for velocity and for weatherly qualities. The small dimensions involve the advantage of light draught of water, diminished expense, and less numerous crew. The diminished displacement with the small dimensions involves quicker return of capital and greater safety in navigation.

The answer to the second question, as to the limit in the size of the vessel to which the substitution of iron for "timber" may be carried, appears also to be involved in the foregoing considerations. For, if greater strength may be obtained with equal weight of material, or equal strength with less weight of material, there can be no limit short of that limitation which may equally apply to "timber." And, by an application of the foregoing reasoning to the question at issue, it appears that a first-rate may be more strongly built of iron than of timber, with

the same light displacement, and equally strong built, but capable of carrying a greater quantity of water, provisions, and stores, with the same load displacement; or, equally strongly built, and capable of carrying an equal quantity of water, provisions and stores, with a less load displacement. This may appear to be a bold and startling result of our investigation: but if our original assumption be correct, it is, nevertheless, within the bounds of truth. Nay, it is even an under estimate of the limit to the substitution of iron for wood in the construction of ships. For the limit to the possibility of constructing a fabric of any conceivable dimensions is necessarily dependent upon the ratio of the strength of the material used to its weight. And as this is greater in iron than in the "timber" of the timber-built ship, the limit of dimensions for the iron-built ship is more extended than the limit of the dimensions of the timber-built ship.

It may, perhaps, be necessary to repeat that the word "timber" in this investigation means the copper, iron and wood of the timber-built ship.

If we take into consideration the very few years that have passed since the first application of iron as a total substitute for timber in building ships, it is astonishing to what perfection this branch of art has arrived; and, consequently, very great credit attaches to Mr. Laird, for the intelligence and talent which he has displayed in thus adding to the manufacturing resources of this country. As the art proceeds, and becomes more general, there can be no doubt that great improvements will be made. This is said without the slightest intention of withholding from Mr. Laird the high meed of praise which is so justly his due. In speaking of the progress of improvement, we are too prone virtually to set bounds to its advance; forgetful of the fact that perfection being unattainable by mortals, it is a mere abstract term, meaning one thing yesterday, another today, and another tomorrow. One improvement, and that probably not an unimportant one, would be the diagonal arrangement of the plates or planking of the vessel, and also of the angle iron frames. Iron offers greater resistance to compression than to extension. And bar-iron offers greater proportionate resistance to extension than plate-iron. These facts, which have been ascertained by experiment, enable us to determine upon the positions in which to place the plates, so that the peculiarities of strength of the angle and bar-iron shall be most advantageously developed. The angle iron should be placed so as to act as trusses in supporting the weight of the extremities of the vessel; the weight or downward pressure of which is necessarily greater than the upward pressure of the water. The frames should, therefore, be placed with their heels toward the midship part of the ship, and their heads inclining forward in the fore body, and aft in the after body to an angle of 45 degrees with the horizon. The plates have already been described as connected together at their edges by being riveted to strips of bar-iron. These may form the ties, and the direction of these continuous bands should be at right angles to the direction of the angle iron frames. Thus the whole body would be divided by these two series of lines into compartments; which, in the vertical part of the body, would be squares, each with one diameter vertical and the other horizontal, as in the following sketch. The

double lines are the angle iron frames, the single lines the continuous bars to which the edges of the sheets are riveted. Of course, the angle iron frames will receive the rivets of one series of seams, and therefore by this adjustment some small weight of iron will be saved.



The floors and all the lower part of the vessel may remain as in the *Nemesis*. The introduction of water-tight bulkheads is very good. This has been before attempted in timber-built ships, but has failed, from the ignorance of the projectors of the nature of the pressure of water. They assumed that a caulked bulkhead of three or four inches in thickness, that would be quite adequate to resist the pressure of a small depth of water, would also be of sufficient strength to resist the pressure to which it would be subjected by deeper immersion. Bulkheads, to resist the pressure of water, must increase in strength in proportion to their depth below the surface of the water. This fact must not be lost sight of in the construction of these water-tight iron bulkheads. It is not of consequence with small draughts of water; but when larger and deeper vessels are built of iron, it will become a question of importance; and if not duly attended to, the idea of safety from water-tight bulkheads may be most delusive.

The question of the durability of these vessels, of their little liability to accident, and of the ease with which damage done to them may be repaired, appears to be very clearly proved from the experience which has already been obtained on these points; and this is not little, for there are boats built by Mr. Laird in both North and South America; in all parts of India, and on the Euphrates and the Indus; in Egypt, on the Nile and in the Mediterranean; on the Vistula, on the Shannon, and on the Thames. One of these boats on the Savannah has been constantly at work for these last six years without any repair; which is a great test, if we consider the frequent, constant caulking required to preserve a timber-built ship. There is also a steam-yacht built of iron, the *Glow-worm*, the property of Assheton Smith, Esq. This vessel has made the passage from Bristol to Carnarvon, a distance of 210 miles, in 18 hours. In the Report to the House of Commons on Steam-Vessel Accidents, we find the following stated of the *Garryowen*, one of these vessels:—"We went ashore about two cables' length to the eastward of the pier (Kilrush) and struck very heavy for the first hour. The ground under our weather-bilge was rather soft clay, covered with shingle and loose stones, some of them pretty large. Under our inside, or lee-bilge, the ground was very hard, being a foot-path at low water. I was greatly afraid she would be very much injured by it in her bottom, but I am happy to say she has not received any injury; in fact, her bottom is as perfect and as good as on the day she left Liverpool—not a single rivet started nor a rivet-head flown off.

If an oak vessel, with the cargo I had on deck, was to go on shore where the Garryowen did, and get such a hammering, they would have a different story to tell. . . . Out of twenty-seven vessels that got ashore that night, the Garryowen is the only one that is not damaged more or less."

Colonel Chesney, the commander of the Euphrates expedition, writes thus of the iron vessels which were employed on that service:—"It is but right to tell you that the iron vessels constructed by you far exceeded my expectations, as well as those of the naval officers employed in the late expedition, who would one and all bear testimony anywhere to their extraordinary solidity; indeed, it was often repeated by Lieut. Cleaveland, and the others, that any wooden vessel must have been destroyed before the service was one-half completed; whereas the Euphrates was as perfect when they laid her up at Bagdad as the first day she was floated. As I am now occupied in preparing a work on the expedition, I shall have a better opportunity than the present of doing justice to the subject of iron vessels, for it is my belief that they will entirely supersede wood, on account of their comparative strength, cheapness, and durability, whenever people are satisfied that their only disadvantage—the free working of the compass—has been overcome.

"In the Euphrates, which is entirely of iron, there was a variation of about 10° , and that with little change, but the compass worked very sluggishly, and required extreme care.

"In the Tigris, with the upper part (as you know) of wood, it worked freely; indeed, as far as I could judge—and I had a great deal of practice, taking bearings for the survey—as well as in any ordinary vessel; and if we had placed the compass as far *above* the iron in the Euphrates as it happened to be by chance in the Tigris, I think it would have worked quite as well."

The effect of the iron upon the compass appears to be one of the most serious objections to these boats; for although Colonel Chesney's letter is even on this point favorable, it is not conclusive. There is some doubt, indeed, whether the accident which happened to the *Nemesis* may not be attributed to her compasses. There is a local attraction in all ships, in consequence of the great quantity of iron used in their construction and in their armament. To obviate the inconvenience, and even danger, which might arise from this, Professor Barlow proposed to ascertain experimentally, for each ship, the amount of this local attraction, and to counteract it by a plate of iron, placed so as to have an equal but an opposite effect on the needle. Several ships, especially those destined for the surveying service, have been fitted with these plates. In the *Nemesis*, magnets are used to exert a similar counter-acting influence on her compasses; probably because it was thought that Barlow's plates would not act with sufficient energy to counteract the local attraction of such a vast surface of iron; and also because, according to Professor Airey, the form of Barlow's plate appears objectionable, in so far as having its broadside turned towards the compass, it occupies a considerable arc of azimuth. Professor Airey, also, prefers a long box, filled with iron chain, as less likely to possess the permanent magnetism, from which, he says, no plate iron is free. The correctors to the compasses of the *Nemesis* were fitted on the

system proposed by Professor Airey; but it is justice only to add that they were not fitted under the immediate inspection of that gentleman.* There is one experiment, which was tried in connection with the fitting of Barlow's plates, which might possibly be brought to bear upon the question of the local attraction of these iron ships. It is this: About thirteen or fourteen years ago, the *Phaëton*, a frigate, was fitted with a mainmast and a bowsprit, both of iron, and there was great anxiety as to the effect of these large surfaces of iron on the compass. Barlow's plates were consequently ordered to be fitted. The ship was experimented upon, in order to determine the amount of the local attraction; when, much to the astonishment of all interested in the question, it was found that, at the station fixed upon for the site of the compass, the mast and bowsprit had evidently a correcting influence to that of the other iron-work in the ship. The result of which was, that the local attraction, as determined by experiment, was so very inconsiderable that it did not even come within the limits of the attractions obtained by Professor Barlow for his plates. A detailed account of this experiment, drawn up by the gentleman who conducted it, Mr. Bennett, of her Majesty's Dockyard at Portsmouth, may be found in the 2d number of "*Papers on Naval Architecture*." Now, to apply this to the case of a ship wholly of iron—may not that exact spot be found by experiment in an iron ship, which was found accidentally in the *Phaëton*, at which the influence of the total amount of all the attractions is nothing?—that is, the common centre of all the attractions. In all probability, this spot might not be at a convenient distance from the wheel, but that is of very minor importance. It would be sufficient for safety, if there were one compass on board of a ship which could be relied upon as being correct, since a reference to it might always be made. It may be objected that the experiments to ascertain this precise spot would be too extensive and tedious. The placing the magnets, which are at present fitted on board of the *Nemesis*, required nearly a month of preliminary observations and experiments. To any one who has assisted, as I have done, in conducting the experiments by which the position for Barlow's correcting plate is determined, it certainly must appear that to ascertain the centre of attraction in a ship would be attended with far less difficulty than must have been experienced in the case of fitting these magnets. In the months of October and November, 1835, a series of experiments was made by the direction of the Board of Admiralty, under the superintendence of Commander Johnson, of the Royal Navy, upon one of the iron steam-vessels built by Mr. Laird—the *Garryowen*. By these experiments the amount of the deviation of the compass in various parts of the ship was determined; and a very curious fact appears to have been established, which was, that the vessel itself had become magnetic to a very considerable degree. The experiments appear to have been directed to the discovery of the most advantageous position in which to place a compass, and to remove it to such an elevation above the deck as to avoid the separate actions of particular portions of the iron work, that the joint effects of all the iron in the vessel might be resolvable into one force, to be discovered and counter-

* See Phil. Trans. for 1839. Part I.

acted either by Barlow's plate or by a magnet. But the common centre of all the attractions, or, in other words, the point of no attraction does not appear to have been the subject of inquiry—whether, when found, it would be at all applicable as a station, for a compass must depend upon its locality.

As iron-built ships will probably rapidly increase in numbers, it is very necessary not only that the principles on which the correction of the local attraction affecting their compasses depends, but also the practical method of adjusting the correctors should be explained in such familiar language that both may be understood by practical navigators, the class of men who will have the command of the greater number of these vessels. At present no such explanation exists, and it is to be feared that the necessity for it will soon be made most painfully apparent, unless immediate steps are taken to supply the want. Professor Airey's paper, in the Philosophical Transactions, is a sealed book to all but men of high science, and he will not have completed the task he has so ably commenced until he has reduced the subject, both in its principles and in its practice, to the level of a far lower standard of knowledge than it requires at present; in fact, to the level of uninstructed common sense.

United Service Journal.

SIR JAMES ANDERSON'S BOILER.

Since the invention of locomotive carriages, it has been a *desideratum* to get engines which would run along common roads, and many attempts have been made to remove the difficulty, but without success, until the recent triumph of Sir James Anderson. It has been proved by engineers that the difficulty of drawing carriages along a common road, is ten times greater than along a railroad; in other words, that the resistance is ten times greater; and a power that would drag a load of 100 tons on the railroad, could carry only 10 tons on the ordinary road. The great obstacle was to overcome this very disproportionate resistance. The world has been so long deceived by promises of steam vehicles which could run upon common roads, that a conviction is raised of the impossibility of the attempt succeeding; but Sir James Anderson demonstrates the practicability of the undertaking, by an invention upon which he has been engaged for fourteen years, and which he now introduces to the public notice. This boiler resembles, externally, the figure of a house, viewing it at its gable; the sides and roof composed of plates or chambers of water, two inches thick; internally, of a succession of plates of same thickness, placed like partitions in a house, every second partition fitting home closely to the roof, and communicating by tubes to the steam reservoir at top; alternate partitions (or water plates) fitting closely to the floor or bottom of the boiler, and communicating by tubes to the general supply, or horizontal tube for admission of water; thus giving free ingress for water at bottom, and free egress for steam at top; while the fire, being placed in a space at one end, and the funnel at the opposite, a continuous flue is formed, ascending and descending alternately, until the heat is robbed almost to its last degree, before being permitted to escape. The construction

of each plate or water-chamber is thus described : " They are composed of sheet-iron, flat, vertical bars, two inches thick, being interposed between, at three inches asunder ; and at every three inches a rivet passes through the bar and sheet : thus, over the whole surface the strongest rivets hold the sheets together at each three inches, giving a strength more than sufficient to resist any possible pressure from within ; and the bars placed between, making it impossible (even should all water have left the boiler, and a vacuum be thus created) that it could collapse." From the resistance offered to carriages on common roads, the points to be attained in locomotive carriages for such roads, are increased strength, a size not incompatible with speed ; the rapid development of steam, and also economy of fuel. In the first place, strength is obtained in the boiler now under consideration, by means of flat chambers, which possess strength, and which still fit in a boiler of a size consistent with speed. These flat chambers are each three inches long, connected with cross bars, and fixed with rivets at every three inches. They are placed in every part of the boiler, and occupy a space six feet high, six feet long, and three feet broad.

A boiler of this kind was, we understand, completed about 15 months back, and has continued to work every day since most successfully, without producing a leak or the slightest derangement ; and this, notwithstanding the steam has frequently been raised to upwards of 500 lbs. pressure upon each square inch of surface. Now the boiler contains 360 feet of working surface, which, multiplied by 144, gives 51,840 inches, and this multiplied by 500 lbs. gives the enormous pressure of 25,920,000 lbs. upon the whole boiler ! A compact machine like this, which is capable of generating, sustaining, and applying so enormous a force, affords, we think, a pretty good test of the excellence of the workmanship, as well as of the principle of its construction. It is very satisfactory to have a boiler capable of resisting such a pressure ; but one-tenth of it is fully adequate to all the requisites of actual practice. Then as to the rapid development of steam—as this is made to take place from the plates being only two inches asunder, an immense quantity of steam can be produced almost instantaneously. The fire is kept up by means of a fanner worked by machinery. The air-tubes are enclosed in a cylinder of water, which water instantly condenses the waste steam, and a portion of the heat is carried on by the current of air into the fire ; and at the same time, by the instantaneous condensation of the steam, all noise is absolutely removed. The incrustation that has hitherto been so fatal to boilers, is totally prevented in Sir James's, by the unequal heating of the water in the chambers, which causes a constant circulation of the fluid. And again : in other boilers consisting of tubes, the joints and solder are exposed to the action of the fire. In that under consideration, there is riveting without soldering, and the joints are preserved from the action of the fire by the interposition of a floor of iron. It is said that four-pence a mile will pay the cost of fuel, an expense trifling in the extreme.

Thus far we have described the construction, strength and capability of the invention ; but there is one little point, without which, we might say, the whole were useless. This consists in placing perforated cones of fine wire over the orifices which admit the steam into the reservoir.

At first the orifices were used without the cones, and the consequence was, that from the fact of every chamber being filled with water to the top, and coming thus within a few inches of the reservoir, the ebullition of boiling caused a quantity of aqueous matter to be forced with the steam into the cylinders, and the engine became clogged. The difficulty was for a length of time insurmountable; but great as it was, the inventor's perseverance was greater. Reflection suggested a remedy in the application of the cones: they were adapted to the boiler, where for a period of more than eighteen months they have performed their work, untouched and uninjured, nor has the boiler all that time cost one shilling for repairs, or been one day idle.

In consequence of having such an enormous power in the boiler as 25,920,000 lbs. pressure, the talented inventor was enabled to overcome the difficulty of ascending hills with a locomotive, in the following manner: Instead of acting directly on the axle to which the propelling wheel is attached, another axle is set in motion, on which are a large and a small toothed wheel, the same being on the working axle: when the carriage is moving on a level, the large wheel having 24 teeth, acts on the smaller having only 6; consequently one revolution of the larger wheel will produce four revolutions of the propelling axle: here power is dispensed with to increase velocity; but when the engine-man approaches a hill, he can shift the steam-axle, so as to bring its small-toothed wheel into contact with the large-toothed wheel of the propelling axle. Here the case is instantly reversed; velocity is sacrificed to acquire power; and thus Sir James Anderson has surmounted what had been previously deemed impracticable.

Manchester Guardian.

MISCELLANEOUS.

Newly Invented Gas-Light.—The newly invented gas of the Count de Val Marino, some mention of which was made in the Repertory for May, has, since the experiment there described, been tested in the fullest manner by comparison with the ordinary coal gas. A recent experiment, conducted in the presence of several distinguished and scientific persons, gave much satisfaction to those who witnessed it, and showed by its results that the new gas possesses decided advantages as to brilliancy, cheapness, and simplicity of production.

The following extract from Newton's London Journal for June, which contains an account of this last named trial, describes in a more minute manner than our former article the process by which the gas is formed:

In order to compare the patent gas with that now in use, three lamp-posts have been erected at the top of John-street, Berkeley-square:

one of them is lighted with the ordinary gas supplied by one of the public companies; another, having a burner of precisely the same description with the first, is supplied with the patent gas; while the third is not only lighted with the new gas, but is furnished also with a burner invented by the Count de Val Marino.

The apparatus for preparing this new gas was temporarily fitted up for this occasion, and the manner in which the gas is generated was explained in a very satisfactory manner to the company by the inventor, who speaks only in the French language. He pointed out the particular construction of the furnace and its arrangements, in the following manner, as nearly as we could collect the facts: There are three cylindrical retorts placed vertically side by side, and enclosed in a furnace of suitable dimensions, to heat them up to what is technically called a red white heat: this is obtained in a short time, with but a trifling cost for fuel. The requisite heat having been obtained, water is allowed to drop rapidly, but not to stream, into the first retort; and tar into the third one. We must here observe, that the three retorts are charged with coke broken into pieces about the size of a walnut. In the first retort the water is decomposed, the hydrogen is separated from the oxygen, which, uniting with a certain portion of carbonized vapor, produces carbonic acid gas. This product, with the liberated hydrogen, now passes into the second retort, and it is in this retort that the carbonic acid gas is changed into oxide of carbon, by passing through the heated interstices of the coke. The liberated hydrogen, with the other products, unite in the third retort with the superabundance of carbon which is produced by the decomposition of the tar; and thus is formed a pure carburetted hydrogen gas, not requiring any further purification.

The proportions of the water and tar to each other for producing the purest and strongest gas, are three parts of the former to one part of the latter substance: consequently, the materials being very cheap, the product cannot bear any great price.

This gas seems to be a very active and powerful agent, as it appeared in juxtaposition with the common gas; and when carefully prepared, the flame it produces is clearer, and consequently more bright, than the same surface of the ordinary gas.

Wreck of the Royal George.—The operations have been continued daily, with great activity and success, two divers being employed every slack tide in slinging the fragments of the wreck, which gives employment to about 80 men—sappers and miners, riggers and naval pensioners—who get them up and put them on board the Lively lighter, which has been in constant attendance, and carried these interesting remains into the dock-yard, where an immense pile of timber, thus recovered, has been deposited, nearly opposite to the Superintendent's office, attracting a number of spectators. Since the great explosion of the 11th instant, the weather has been very favorable, excepting on the afternoon of Friday the 15th, when the work was necessarily suspended. The stern-post has been got up, broken into three pieces by that explosion, together with a large fragment of dead wood, that stood immediately over and above the keel, and was also connected with the stern-

post. A very curious mass, consisting of part of the lower deck, with a portion of beam, and two knees below the deck-plank, and a rider or upright knee above it, together with part of a port, and both the inside and outside planking remaining on each side of a fragment of a timber, may now be seen in the dock-yard. A very large cable has also been got up, measuring 24 inches round, and about 90 fathoms in length, which was generally very sound, but has been broken into several pieces, so that the diver had to descend repeatedly for two days, before he slung the whole of it. It was laid open by a small charge of about 45 lbs. of powder, which broke up a lower-deck beam above it, and at the same time made a crater in the mud below, which enabled the diver on his next descent to discover this interesting relic. All is clear now above the orlop deck, except some beams of the lower deck which still remain. This day (Saturday) red flags were hoisted on board the two lumps, at 10 o'clock, as a signal that two explosions of 250 lbs. of powder each, would take place at the next slack tide; and two divers were sent down, John Fullagar from No. 4, and Geo. Hall from No. 5, lumps, to make preparations for placing the two charges—one under the main hatchway of the orlop deck, the other near the bread room. Lieut. Symonds, the executive engineer, who made all the arrangements on this occasion, as well as for the great explosion of the 11th, with much skill, then sent down the charges, with the divers, who reported that they were well placed; and having removed the lumps to a little distance, he posted himself at one voltaic battery, whilst Serjeant Major Jones had charge of the other. Col. Pasley then gave the word to fire, but only one explosion took place, which was effected by four cells of Prof. Daniell's battery, at the distance of 240 feet. This produced the usual effect of a great commotion in the water, in the form of an inverted bowl, spreading to a considerable distance, but not rising any great height, several seconds elapsing after a sharp shock was felt before this agitation of the water took place. The second explosion, which was to have been fired by means of Mr. Alfred Smee's voltaic battery, did not take place on completing the circuit; but Serjeant Major Jones, feeling the shock of the other explosion, believed it to be his own, for he completed the voltaic circuit on first receiving the order to fire. Being ordered to complete the circuit a second time, he did so; and upon keeping up the contact for about four seconds, the explosion was effected at a distance of 460 feet. The battery was in a Wollaston's porcelain trough of 14 cells, with plates 5 inches square. This was the first time that Mr. Smee's battery had been used in the operations of the Royal George; and if it had been used by persons of more experience, the contact ought to have been preserved longer, as this battery, which has great advantages, and said to be more powerful than Daniell's when an equal surface of metal is exposed, hangs fire, as it were, for some seconds; whereas, the ignition of gunpowder by Daniell's battery is instantaneous, that is, when a sufficient number of cells are used. After these explosions, which were witnessed by Admirals Sir Edward Codrington and Bouverie, Major General Sir Hercules Pakenham, and a number of officers of both services, and numerous other spectators, the divers repeatedly went down again, and lashed large pieces of timber, amongst which we observed the parts of

a lower-deck beam. A human skull, with teeth, was also brought up from the after part of the wreck, which Col. Pasley has declared his intention to bury in Kingston church-yard, together with such other remains of skeletons as may be obtained hereafter.

Hampshire Telegraph.

Galvanic Electrototype and Daguerreotype.—Dr. Simon, of Dover, has just succeeded in reversing the image obtained by the Daguerreian process, which is known to reproduce the objects from nature in a contrary sense, viz. the left tower of a castle will be the right, and the right the left, on the drawing, which imperfection, however, can be obviated by parallel glasses, a new improvement in the Daguerreotype, by M. Lerebourg, of Paris. Dr. Simon has contrived a new galvanic trough, which he calls “Simon’s Galvanic Electro-Plastic Battery.” It is exceedingly portable, and most effectual, and has by the galvanic electrototype discovery reobtained and fixed on a most beautifully polished surface of copper the view of Dover Castle, and reproduced in its right sense. This new and beautiful discovery will no doubt attract the attention of the lovers and admirers of science and of the fine arts. The science is only in its infancy, and promises the happiest results.

Dover Chronicle.

Good Husbandry.—The editor of the Maine Cultivator tills but a single acre of land; but this he does in such a manner as to obtain from it an astonishing amount of produce.

One third of an acre he devotes annually to corn—the long-eared, large-kerneled, eight-rowed yellow corn, that is not very early and not very late. With him, it has ripened every year for the last ten years that he has cultivated it. The soil he makes rich. He applies to it, before ploughing, at the rate of 18 or 20 cords of long manure to the acre, (or 6 to the third of an acre) and turns it under by the plough. He plants the hills $3\frac{1}{2}$ feet apart one way, and 3 feet the other, *exactly*, by measurement with a line. In each hill he deposits either a shovelful of old, rotten, hog manure, or as much light manure as will not overstimulate the crop. From this third of an acre he has realized, on the average, for years, over 30 bushels of sound corn for grinding, besides a little gig corn for hogs in the fall of the year. This is as much corn as he needs in his family, beside a sufficient surplus for fattening one large or two small hogs. From the same land, he ordinarily obtains some 2 or 300 pumpkins, which serve important purposes in the family, besides being an excellent article for boiling up with the hogs’ potatoes, giving a cow, &c. From the same land, too, he has generally obtained all the dry white beans he has needed in his family to go with his pork, which he raises by the avails of his land, without purchasing of others. The corn fodder is carefully cut and cured, and helps as a subsistence for the cow. So much for *one third* of an acre.

A small portion of land is set apart for the culture of onions. Ordinarily he raises from 50 to 70 bushels on a bed, say half a dozen rods square. These he sells on the average at \$1 per bushel—say for \$60 per year. This purchases his flour and rye, at common prices. So that from the first third of an acre, and an onion bed, he raises all his bread—brown and white.

On two other large beds, he grows generally about fifty bushels of

mangel wurtzel and carrots. These are for the cow's winter provender. They more than pay for themselves in the milk and butter—to say nothing of the saving of hay and other provender. With a very little hay, together with the corn fodder and roots, a good cow (and he finds it economy always to keep the *best*) may be kept through the winter.

Potatoes, for summer and autumn use, are planted on the margins, and wherever there is a vacant chance for a hill; and a department is expressly devoted to them, large enough to raise all that are wanted for the table, and enough to spare for the hogs, &c.

So far relates to bread, butter, pork—and we might add, poultry.

Then the rest of the land is devoted to—too many things to mention here: beets, parsnips, cabbages, turnips, green beans, peas, green corn, cucumbers, melons, squashes—summer and winter sorts—&c. &c. besides fruits and flowers of various kinds: grapes, Antwerp raspberries, black do.; currants—white, red, black, and yellow; English and common gooseberries; and a few choice apple, pear, plum, cherry, peach, and quince trees. All this is from a *single acre*, which he cultivates mostly with his own hand.

Poughkeepsie Telegraph.

This, if rightly taken, contains a most valuable lesson. The man who gave it to the world did more for his race than if he had written an encyclopedia.

Use of the Walnut Tree.—Walnuts yield half their own weight in oil, whose flavor is considered to equal that of the finest Lucca oil. This very fruitful tree, which we see flourishing along the high road, and in the orchards of peasants, is one of great utility to the German: his furniture is made of it; the leaves dye a good black; and he feeds his cattle with the shells of the nuts that have supplied his oil.

Experiments in Bread Making.—Some very important experiments have been going on in Paris, for some days past, in the presence of the Syndics of the Corporation of Bakers, and a commission named by the government, on the preparation of bread. By a new discovery, the quantity of flour, which in the ordinary process yields only 102 loaves, is now made to yield 122 to 127. The discovery consists in the mode of fermentation. The bread, which is of the same weight as in the common mode of panification, loaf for loaf, is equally nutritive, and is superior in flavor. I have tested some of it, and can therefore confirm this part of the statement. This is, indeed, a very important discovery in the present high price of bread, and secures a provision for a large increase of population. If generally adopted, it will render the application of the Malthusian doctrines unnecessary for at least a quarter of a century, and in the meantime some other discovery may be made which will prevent the abrogation of the ordinance, “increase and multiply.”

Cor. of London Globe.

Curious Discovery.—A strange lesson has just been read to antiquaries and virtuosi, by a remarkable discovery in the British Museum. The famous Portland Vase—the pride of ancient and wonder of modern art, the theme of many an essay and many a panegyric—has let in a new light upon the fictile representations of antiquity. A few weeks ago it

was deemed necessary to wash this noble relic, in order to remove the accumulated dust of ages; when, lo! almost every figure was found to be designated by an inscription, and the purport and procession of the whole vase (we believe) to be thereby explained! We have not yet had an opportunity of examining this memorable revelation, but can state that the theories of the late Mr. Payne Knight and Mr. Christie are utterly overturned by the facts now ascertained. When we consider how admirably these theories were made out, and how satisfactory they appeared to be, need we repeat that this is a strange lesson to antiquaries and virtuosi!

Literary Gazette.

Steam-Pressure Indicator and Safety-Valve.—At the last meeting of the Society of Arts, the gold Isis medal was awarded to Mr. Robert McEwen, for a mercurial guage, which answers the double purpose of an indicator of steam-pressure and a safety-valve for engine boilers. The novelty of the invention consists in the employment of a mercurial tube as a safe-vent for the steam (these tubes having hitherto been used only as indicators of pressure) and of a length sufficient to allow the steam to acquire a dangerous degree of pressure without giving any other notice of the fact than that which may be observed by the eye. As the action of Mr. McEwen's safety-valve depends on a purely *physical* principle, viz. the opposition of the elastic force of steam to the static pressure of mercury without a *mechanical* obstruction of any kind, it affords a free vent for the steam when its pressure exceeds the limit, corresponding to the length to which the tubes are adjusted, according to the strength of the boiler.

New Escapement.—At the meeting of the Royal Society on the 5th inst. a description was read of a new escapement, invented by the late Captain Kater, communicated by his son, Edward Kater, Esq. The great object aimed at by Capt. Kater, in the construction of the escapement of a chronometer, is to communicate equal impulses to the pendulum through some principle perfect in itself, and not dependent for its success on superior execution. In the escapement invented by him, the pendulum merely raises a weight through an increased space in its descent. It neither unlocks a detent nor has anything to do with the train; and as the weight raised, and the spaces described, are constant quantities, this escapement is, in the strict meaning of the term, one of equal impulse.

Glass Weaving.—Few are aware that glass is now woven with silk, although its brittle nature would appear to render such a method of manufacturing it impossible. The fact, however, is indisputable; the new material being substituted for gold and silver thread, than either of which it is more durable, possessing besides the advantage of never tarnishing. What is technically called the warp, that is, the long way of any loom-manufactured article, is composed of silk, which forms the body and ground-work, on which the pattern in glass appears as the weft or cross work. The requisite flexibility of glass thread for manufacturing purposes is to be ascribed to its extreme fineness, as not less than 50 or 60 of the original threads (produced by steam-engine power) are required to form one thread for the loom. The process is slow, as

not more than a yard can be manufactured in 12 hours. The work, however, is extremely beautiful, and comparatively cheap, inasmuch as no similar stuff where bullion is really introduced can be purchased for anything like the price at which this is sold; added to this, it is, as far as the glass is concerned, imperishable. Some admirable specimens of the manufactured article may be seen at the Polytechnic Institution, Regent street, especially two patterns of silver on a blue and red ground, and another of gold on crimson. The jacquard-loom by which it is woven may also be seen at the same establishment.

Times.

Preservation of Timber.—M. Boucherie proposes to effect this by introducing pyrolignite of iron by absorption into the tissue of the wood, immediately after the fall of the tree, or even while it is yet standing. This simple operation is said to be remarkably efficacious:—1. In protecting the tree against rot, dry or humid.—2. In increasing its hardness. 3. In developing and preserving its flexibility and elasticity.—4. In preventing the cracks which result from variations of the atmosphere when brought into use.—5. In reducing its inflammable and combustible characters.—6. In giving it colors and odors at once varied and enduring.

Athlænum.

Improvement in Paddle Wheels.—On Friday last, Sir John Rennie, accompanied by a few scientific friends, went through a series of interesting experiments in the West India Docks, for the purpose of testing the capabilities of a new form of propeller. In this locomotive age, any invention tending to the improvement of our means and facilities of intercommunication, must necessarily claim a lively and general interest.

The present propeller is an important modification of the old paddle, being an ingenious application of a most simple and beautiful principle in nature, and one generally prevailing where the propulsion of the individual is her object, viz. that of the rhomboidal figure. Hence we may perceive that the tails of fish, the feet of aquatic fowls, and the wings of birds, generally partake more or less of this character; for, as was justly observed by the talented inventor (Mr. Rennie) nature never attains her ends but by the best and most efficacious means; and certainly if any additional argument were required to establish the fact of "whatever is, is right," when applied to her operations, it would be in the complete success of last Friday's experiments. The mode by which the propelling power is conveyed to the vessel is not dissimilar to the old wheel, the improvement being principally in the arrangement and form of the floats, which are not very unlike the canoe paddles used by many of the South Sea Islanders. By the way—it is worthy of note, as a singular and remarkable feature in the genius of savage life generally, that felicitous adaptation to its own uses of the wise economy with which nature invariably operates her purposes.

The more obvious advantages derived from the present invention consists in a reduction of more than one half in the breadth of the paddle wheel and boxes, consequently the same amount in the superficial area of the floats, with, at the same time, an increase of effective power, which, differently from the common method, act with their length vertically, thereby giving so much additional compactness to the whole—

a vast improvement, it must be admitted, in the efficiency of vessels subject to the roll and action of a heavy sea. The other and more practical advantages are in the smoothness of the motion, creating little or no agitation in the wake of the vessel—a desideratum in river or other confined navigation; the facility of suiting the immersion to the variable draught of the vessel; above all, the perfect equalization of the power to the effect in every portion of the float. We understand that the plan theoretically has met with the approbation of Professor Barlow and other scientific men. The experiment was tried upon a beautiful little vessel, and in a succession of trips made during the course of the afternoon, up and down the spacious area of the import dock, it was particularly remarked the ease with which she turned and threaded her way among the numerous crafts lying in the basin. The gentlemen present, among whom was Capt. Austin, R. N. expressed themselves in the highest terms upon the satisfactory result of the experiment, being from the peculiar simplicity of the construction admirably adapted for war and sea-going vessels. The patentees, we believe, intend shortly applying the principle upon a more extended scale.

Patentees' Advertiser.

The uses of Slate.—Since the repeal of the duty on slate, it has been applied to a variety of valuable purposes. It may be sawn into slabs of almost any dimensions, and is used in the warehouses of the London Dock Company as a substitute for other kinds of flooring. It is capable of sustaining any weight, if laid on an adequate foundation; and is so easily cleaned, that goods of the most opposite description—fruits and hides, spices and old rags, sugar and pepper—succeed each other rapidly on the same floor, without the slightest damage. A floor of slate, one or two inches thick, may be laid down within one-twentieth of the time required for other materials; it is much cheaper than wood or granite, and may be laid in warehouses over decayed wooden floors with great advantage. In sugar manufactories, brew-houses, granaries, coach manufactories, and other similar buildings, this material serves to combine cleanliness with economy. It is applied to the fronting of houses, instead of cement, and looks almost as well as Portland stone. The slabs are neatly attached to the wall: they are then painted; and while the paint is fresh, it is sprinkled with sand. Laid down in the front of wharves, it prevents the accumulation of mud, the removal of which is attended with inconvenience and expense. Strong and excellent tanks are now made of slate; and in consequence of the instrumentality of the saw, great improvements have been recently made in the roofing of out-houses. We are surprised that companies do not line their canals with this material: if they did, they would not only avoid the necessity of occasionally using granite for that purpose, but might also run steam-boats on canals, with the utmost facility.

To take off the impression of Old Prints.—Take Venice or Windsor soap, which must be cut into small morsels, a certain quantity of potash, with as much quicklime, and boil the whole in a pot. Wet the engraved side of the print gently with this liquor, then apply to it a sheet of white paper, and roll it several times with a roller, in order that the impression may be complete.

Anti Dry-Rot Process.—The following letter has been recently addressed to the directors of the Anti Dry-Rot Company :

“GENTLEMEN—Agreeably to the instructions received from Mr. Taswell Thompson, your secretary, I have surveyed the slip laid down by the West India Dock Company, at Blackwall, and which is constructed of American birch, Kyanised. The slip was laid down in March, 1837, and has, therefore, been in use nearly three years: the lower part of it is chiefly under water, and the upper part rests in the soil of the strand, which is always saturated with water. The wood of which it is composed is of American birch, a tree remarkable for containing an extraordinary quantity of sap, and for being what Evelyn in his discourse on forest trees, calls ‘the worst of timber.’ It is particularly liable to early decay; and I have no doubt but that, without the process of Kyanising, the slip in question would, at the end of the year, have been entirely rotten. Instead, however, of this being the case, I find it, both under and above water, completely sound, as may be ascertained by the accompanying specimens. No. 1, cut from that part most exposed to the action of the water and the worst earth, and which will be found perfectly sound; indeed, so hardened has the wood become, that I found it very difficult to cut off the specimens submitted as a proof of the efficacy of the Kyan patent. Looking at the nature of the wood, its exposed situation, and uses, I consider this a great triumph of the patent over the natural decay of timber, and a most complete and convincing proof of its efficacy. I likewise surveyed the Scotch-fir sleepers, laid under the tram-roads on the premises of the Anti Dry-Rot Company, and found those which had been Kyanised, though buried under a very moist soil, perfectly sound, as may be seen by specimen No. 2; while No. 3 is cut from a sleeper which has not been Kyanised, and will be found to be completely rotten.

“I have the honor to be, gentlemen,

“Your most obedient servant,

(Signed)

“SAMUEL BEAZLEY, *Architect.*”

“Soho Square, Sept. 10, 1839.”

New Life-Boat.—One of the most important inventions to provide against accidents in steam vessels, which came under the notice of the commissioners appointed by the committee of the privy council last session, is the life-boat of Capt. George Smith, of the Royal Navy. At that period the only practical experiment that had been made to test the utility of the invention was on the Carron, a government steamer of between 200 and 300 tons burden. In consequence of the favorable report made respecting the success of that experiment, the lords of the Admiralty sometime ago gave Capt. Smith authority to fit up two boats for the Firefly steamer, a vessel of a much larger class, which has lately been under repair in the dock-yard at Woolwich. This vessel has been fitted up, preparatory to her proceeding to the West Indies, with one of Captain Smith’s life-boats on the top—or rather they form the covering—of the paddle-wheels, of sufficient dimensions to carry with ease 40 persons, and at least 50 on an emergency. Instead of in any manner disfiguring the appearance of the vessel, the boats are closely fitted on with the bottom upwards, so that they rather add to the beauty

and symmetry of the ship than otherwise. So closely, indeed, are they identified with the vessel, that even an experienced seaman may be readily deceived, and have no idea but that the eye is fixed upon an ordinary paddle-box. There is therefore no incumbrance of the decks of the vessel; and as the figure presents a part of a circle, like an inverted cone, instead of the usual form of a square, the progress of the vessel will rather be accelerated than impeded when proceeding against a head wind, as it offers less resistance to it. The greatest advantage of all, however, yet remains to be described. By the erection of a simple apparatus, which runs little hazard of being deranged, the boats may be launched by six men in the space of two minutes and a half; whereas an ordinary ship's boat of the same dimensions would require from 12 to 20 minutes, with the aid of the whole crew. This, it will be obvious, is an incalculable advantage in cases of fire, or other contingency where the saving of life is entirely a question of time.

Shipping Gazette.

Tar-making in Sweden, north of the Bothnian Gulf.—The machinery of the world could scarcely go on without tar; yet we seldom think of inquiring how it is made. Fir trees (*pinus sylvestris*) which are stunted, or from situation not adapted to the saw-mill, are peeled of the bark a fathom or two up the stem. This is done by degrees, so that the tree should not decay and dry up at once, but for five or six years should remain in a vegetative state alive, but not growing. The sap thus checked, makes the wood rich in tar; and at the end of six years the tree is cut down, and is found converted almost entirely into the substance from which the tar is distilled. The roots, rotten stubs, and scorched trunks of the trees felled for clearing land, are all used for making tar. In the burning or distilling, the state of the weather, rain, or wind, in packing the kiln, will make a difference of 12 or 20 per cent in the produce of tar. The labor of transporting tar out of the forest to the river-side is very great. The barrels containing tar are always very thick and strong, because on the way to market they have often to be committed to the stream to carry them down the rapids and waterfalls. The price is only 6s. 8d. sterling to the peasant, and often not so much.

Laing's Tour in Sweden in 1838.

Improved Gas Stove.—At the Bath Instruction Society, last week, the Principal delivered a lecture to the Associates, on the different methods of warming and ventilating buildings, in the course of which he called their attention to a gas stove on a new and improved principle, which has just been fixed in the school-room of the Bath City Commercial School. The common gas stove is merely a covered cylinder of iron, containing a hollow ring communicating with the gas-pipe, and pierced with minute holes, from which the gas burns in small jets. The products of the combustion mixed with a portion of gas, (for the gas is never wholly consumed when burnt in a jet) are discharged into the room, the air of which is thus rendered very unpleasant, and even unwholesome; hence the use of these stoves is confined to halls and shops where there is very free ventilation. In the improved gas stove these evils are entirely avoided. The gas is first mixed with a sufficient proportion of atmospheric air to insure its complete combustion, and

then passes through a plate of wire gauze, on the surface of which it burns with a flickering blue flame. The combustion takes place within an oblong iron box, which is thus heated sufficiently to diffuse a soft and equable warmth through the apartment. A pipe carries off the vapor into the chimney. No inconvenience or risk whatever is connected with the use of the stove, and the fire can be lighted or extinguished with the same facility as a common burner. This consideration, with the perfect freedom from any dust, and the avoiding of all trouble in keeping up the fire, makes the stove particularly desirable for a school room. It also promises to afford an easy, cheap and effectual means of warming a conservatory, or hothouse, and it may be conveniently introduced into dwellings; for in addition to its use in warming the apartments, it may be employed to a considerable extent for cooking. The stove fixed in the Bath City School was made by the inventor Mr. Gilbert, an ingenious mechanic of Falmouth, and was exhibited last month at the annual exhibition of the Royal Polytechnic Society of Cornwall. Any person wishing to see it may be gratified by calling at the school room.

Bath Chronicle.

Compressed Peat Fuel.—Two years ago we directed the public attention to the result of the experiments which had been for some time carrying on by Lord Willoughby de Eresby, for the compression of peat into a fuel, which should answer all the purposes of coal, in agriculture and manufactures, and become an article of immeasurable importance in vast sterile tracts of country, where the latter prolific source of industry and wealth could not be obtained. The house of Savigny & Co. in St. James street, London, (in the cutlery trade) have, it seems, been following up Lord Willoughby's experiments, by the practical manufactory of the various articles which they produce; such articles as make English cutlery the admiration of the world, and spread them, from the finest lancet to the most ordinary knife or scissors, throughout every quarter of the habitable earth; and what the consequence has been, is stated in the following announcement which they have issued:

"Messrs. Philp & Whicker, (late Savigny & Co.) of 67, St. James street, having continued their experiments in the manufacture of cutlery, with the use of peat compressed by the machine invented by Lord Willoughby de Eresby, instead of coal, deem themselves called upon to announce the perfect success which has attended them. Not to mention surgical instruments, instruments of science, and the more common necessities of life, it will be sufficient to apply the test to the important and indispensable production of razors, since superiority with them involves superiority in every other description of cutlery. Messrs. Philp & Whicker have no hesitation in stating that such is the marked result of their experience. They have found the steel wrought from peat, free from sulphur, which cannot be separated from coal, and, consequently, purer, whatever other dross or impurity there may be working out in the process of forging. The metal, then, on being tempered, is capable of taking a finer and more permanent edge; and the trial of razors, for many months, has proved the advantage of this mode of manufacturing them over every other."

This testimony shows the importance of Lord Willoughby's disco-

very, which, like many others, is more likely to be prosecuted advantageously in other quarters than those for whose benefit it was originally contemplated.

Oram's, and other compressed fuels, are now much used, with great advantage, in place of coals. Messrs. Bartholomew, of this city, are using rice-chaff mixed with the dust from Lehigh and other coals; and with the assistance of a blower, produce results far more economical than those obtained by the ordinary fuels.

NOTICES OF NEW PUBLICATIONS.

We have just received No. 103 of the Family Library, published by Harper & Brothers, entitled *History of the Fine Arts*: By BENSON J. LOSSING.

Such a work has been much needed, and Mr. Lossing has fully supplied the desideratum. Perhaps there is no history more interesting or instructive than that of the fine arts; and yet it has remained either untouched, or so diffused as to be unattainable by those who can devote but a limited portion of their time to reading. The work before us may fairly be called a synopsis of the advancement of civilization and the arts. The author has long enjoyed a high reputation both as an artist and writer: we think this work promises to add another laurel to his well-earned fame.

A Series of Select and Original Modern Designs for Dwelling Houses, for the use of Carpenters and Builders. By JOHN HALL, Architect. Baltimore: Published by John Murphy. New-York: Wiley & Putnam.

This work is well arranged for the use of practical men; and from the recommendation of one of our first architects, to whose superior judgment we submitted it for inspection, we cheerfully and confidently commend it to public favor. It contains 24 well-executed plates of ground plans, elevations, &c. &c.

A new and concise Method of Hand-Railing, upon correct principles, simplified to the capacity of every practical Carpenter: Also, a full development of the Cylindric Sections, as applied to Niches, Groins, Domes, and all the most intricate parts of Carpentry. By JOHN HALL, Architect. Same publishers.

Probably no subject connected with carpentry is less generally understood than the arrangement of hand-railing. Most

methods require a better knowledge of mathematics than the practical mechanic is able to obtain. Mr. Hall has simplified this subject considerably; and by the use of the Concentric Ellipsograph (of which he is the inventor) all difficulty in the development of face moulds is done away with, and brought within the comprehension of the merest tyro. It contains eight large plates on the subjects of which it treats.

The Cabinet-Maker's Assistant: embracing the most Modern Style of Cabinet Furniture: exemplified in New Designs, practically arranged on 44 Plates, containing 198 Figures. To which is prefixed a short Treatise on Linear Perspective, for the use of Practical Men. By JOHN HALL, Architect. Same publishers.

This is undoubtedly a judicious selection of the approved patterns, for the use of cabinet makers, and contains some hints relative to perspective drawing which will prove valuable. The drawings are all to a scale, and therefore available as working drawings.

LIST OF AWARDS

AT THE FIFTH ANNUAL FAIR OF THE MECHANICS' INSTITUTE.

The great increase of business arising from the extended usefulness of this institution, has prevented its Directors from preparing the report of the Fair at the usual time.

We extract the following particulars from the Report of the Board of Managers of the late Fair, by which it appears that 163 Diplomas, 41 Silver Medals, and 22 Privileges of the Institute, were awarded to exhibitors, as premiums for superior skill, &c. as follows:

- Drilling Machine. Anson Clark, West Stockbridge, Mass. Diploma.
- Model and Draft for Club Boat. Edward Harvey, (an apprentice)
Brooklyn. Diploma.
- Butts and Hinges. S. C. Salisbury, 237 Water st. Diploma.
- Case Stuffed Birds. Wm. Galbraith, West Hoboken, N. J. Diploma.
- Row-Boat Frolic. W. H. Darling, (an apprentice to W. & J. Crolius,
76 Pitt st.) Diploma and Privileges.
- Patent Lath Machine. Simon Willard, 168 Greenwich st. Diploma.
- Cooking Stove. D. M. De Freest, Troy. Diploma.
- Specimens of Snuff. Charles S. Oakley, 147 Front st. Diploma.
- Model of a Cotton Press. H. Waterman, 9 Mott st. Diploma.
- Embroidered Satin Muff. Miss M. Martin, 235 Hudson st. Diploma.
- Olmstead Stoves. James E. P. Dean, 210 Water st. Diploma.

- Specimens of Straight Turning. Clinton E. Tylee, 94 John st. Priv-
Window Shades. Francis Baker, 299 Broadway. Diploma.
Models of Machinery. Thomas H. Dollay, Brooklyn. Diploma.
Plaster Model of Merchants' Exchange. F. Basham, 44 Carmine st.
Diploma.
Buckskin Gloves. E. Bertrand, 372 Pearl st. Diploma.
Ships' Caboooses. Wood & Co. 237 Water st. Diploma.
3 Transparencies. Edward Newberry, 450 Broome st. Diploma.
Assortment of Bells. Joseph H. Adams, 222 Pearl st. Diploma.
Fancy Chairs. James Bradley & Co. 317 Pearl st. Diploma.
Hall Lamp. Halloran & Fewkes, 70 and 72 Bowery. Diploma.
Case Reels and Bobbins. P.V.H. Van Riper, Paterson, N.J. Diploma.
Small Steam-Engine. Enos Waterbury, Stamford, Conn. Diploma.
Inverted Reciprocating Lever Crank. Peter Tomlinson, Derby, Conn.
Diploma.
Assortment of Barometers and Philosophical Glasses. Geo. Tagliabue,
269 Water st. Silver Medal and Diploma.
Embroidered Sword-Belts. Miss M. Miller, 71 Sullivan st. Diploma.
Trusses and Abdominal Supporters. Amos G. Hull, 4 Astor House,
Vesey st. Diploma.
Reeds and Heddles. Edward Orrell, 244 Spring st. Silver Medal.
2d Best Cooking Stove. Hawes & Baker, Albany. Diploma.
Sign Painting. J. H. Breidenbah, 58 William st. Diploma and Priv.
Guns and Rifles. Wm. Jenks, Springfield, Mass. Silver Medal.
Platform and Counter Scales. Russell & Edwards, 109 Front st. Dipl.
Surveying and Drawing Instruments. Benjamin Pike & Sons, 166
Broadway. Silver Medal.
Army Life-Boat. Roxbury India Rubber Co. 212 Pearl st. Silver
Medal and Diploma.
Silver-mounted Ostrich-Egg Vase. E. S. Brewster, 48 Cortland st.
Diploma.
5 Pieces Children's Clothing. George A. Hoyt & Co. 14 Bowery.
Diploma.
Race-Boat Oars. John A. Pearsall, 402 Water st. Diploma.
Hollow-Ware Casting. Savery & Son, Jersey City. Medal.
Club-Boat John C. Stevens. G. & H. Steers, 227 Lewis st. Diploma.
Broadcloths and Cassimeres. Steele & Wolcott, 62 Pine st. Silver
Medal and Diploma.
Specimen of Woolen Knitting. J. Carpenter, 10 Broad st. Diploma.
Confectionery. T. G. Hodgkins, 49 Cortland st. Diploma.
Assortment of Compasses. Merrill & Davis, 138 Water st. Diploma.
Military Embroidery. Mrs. L. Garesche, 311 Broadway. Diploma.
Parasol. Alexander Lander, 164 Thirteenth st. Privileges.
Chronometer and Watch Springs. G. Quelet & G. Borle, 31 Roose-
velt st. Diploma.
Case Ladies' Boots and Shoes. P. Laboyteaux, 239 Grand st. Diploma.
2 Chandeliers. A.V.H. Webb, 102 Bowery. Diploma. Gold Medal
last year.
Sarcophagus. Leonard & Benedict, Washington City. Diploma.
Sofa and Sideboard Bedsteads. Lyons and Lowe, 46 Howard st.
Diploma.

- Silk Spinner, Silk Reel and Twister. Jonathan Dennis, jr. Portsmouth, R. I. Silver Medal and Diploma.
- Side of Leather. W. Brown & Son, Sullivan co. Diploma.
- Indelible Ink. Samuel J. Osborne. 23 Howard st. Diploma.
- Improved Carriage Wheels. Elisha Folles, Hartford, Conn. Diploma.
- Map of Florida. J. R. Chapin, 129 Grand st. Privileges.
- Worsted Lamp-Mat. Miss Jane E. Rodgers, 410 Broadway. Diploma.
- Muffs and Pelerines. J. C. Mayer, 20 Maiden Lane. Diploma.
- Brass Cornopean and Silver Slide Trumpet. J. C. Rosenberk, 1 Orchard st. Silver Medal and Diploma.
- Silk Banner. W. J. Hannington, 458 Broadway. Diploma.
- Regulator Clock. John Stokell, 59 Elm st. Medal and Diploma.
- Painted Imitation Table Tops. S. Johnson, 180 Fulton st. Silver Medal
- Pencil Drawings. R. H. Howell, 391 Pearl st. Diploma.
- New System of Penmanship. T. Townbrow. Diploma.
- 3 dozen Hatters' Skivers. J. R. Smith, 56 Frankfort st. Silver Medal.
- 2 Oil Paintings. J. H. Cornell, 58 Marion st. Diploma and Priv.
- Model of Fire-proof Ceiling. P. Naylor, 81 Broad st. Diploma.
- Samples of Paper-hangings. G. P. & J. Gratacap, 82 Maiden Lane. Diploma.
- Assortment of Glass Ware, Lamps, Silver and Britannia Ware. D. E. Delavan, 11 Maiden Lane. Silver Medal and Diploma.
- Books, printed for the use of the Blind. S. P. Ruggles, Boston. Silver Medal.
- Model of a Dry Dock. Jonathan Hawes, Auburn. Diploma.
- Model of Club Boat. G. W. Fairchild, 268 Broome st. Privileges.
- Stained Glass. W. Gibson, 548 Pearl st. Diploma. Medal last year.
- German Silver Ware. Wm. Chandless, 267 Spring st. Diploma.
- Dressing-cases, Pocket books, &c. Bussing & Co. 80 William st. Diploma.
- Type Specimen Books. Geo. Bruce & Co. 13 Chambers st. Silver Medal and Diploma.
- 2 sides Sole Leather and Calf-skins. J. H. Bowie, 53 Frankfort st. Diploma.
- 3 frames of Steel Engravings. Henry Jordan, Brooklyn. Silver Med.
- Sign. J. M. Smith, 211 Bowery. Privileges.
- Patent Bank-safe and other Locks. Mackrell & Richardson, 228 Houstoun st. Diploma.
- Paste Blacking. Keeler, Proler & Barnum, 118 Water st. Diploma.
- Ornamental Painting. Fuller & Cafferty, 102 Fulton st. Diploma.
- Varnishing and Polishing. Snell & Torrey, 96 Walker st. Diploma.
- Measuring Rule for the Blind. John W. Hendricks, 13 Stanton st. Diploma.
- Silver Pencil Cases. J. Hague, 25 City Hall place. Silver Medal.
- Model of Club Boat. R. M. Coit, 306 Pearl st. Privileges.
- Model of Steam-Boat Bedstead. W. Woolley, 46 Howard st. Diploma.
- Friction Matches. A. Golsh, 46 Twelfth st. Diploma.
- Worsted Flowers. Mrs. Blanc, William st. Diploma.
- Patent Screw Wrench. C. R. Hewet, Troy. Diploma.
- Salamander Stoneware and Fire-Bricks. Salamander Works, 62 Cannon st. Silver Medal.

- Galvanized Tinned Iron Roofing, &c. Sumner & Naylor, 81 Broad st. Silver Medal and Diploma.
- Lock and Magnet. Francis B. Pye, 561 Broadway. Privileges.
- Stands and Inlaid Tops. J. Coels, 4 James st. Silver Medal.
- Medicated Lozenges. A. Sherman, 106 Nassau st. Diploma.
- Small Bureau. W. J. Thomas, 9 Avenue 6th. Privileges.
- Model of Sub-Marine Paddle-Wheel. L. J. Van Kleeck, 232 Grand st. Diploma.
- Sealot Cloth for Caps. Wm. Davis, 134 Barrow st. Diploma.
- Machinery-cut Wood Type. George F. Nesbitt, Tontine Buildings. Silver Medal and Diploma.
- Seal Cap. Wm. R. King, 183 Water st. Privileges.
- Tin Ware. J. A. Kissam, 188 Water st. Diploma.
- Case of Birds. J. G. Bell, Peale's Museum. Diploma.
- Visiting Cards. A. Hyatt, 1½ Park place. Diploma.
- Rosewood Centre Table. B. Bosch, 445 Broadway. Silver Medal.
- Signs and Transparencies. G. W. Fordham, corner Wall and Pearl sts. Diploma.
- 2 French Chairs. Charles Snyder, 88 Elm st. Privileges.
- German Silver Castings. M. W. Emmons, 14 Spruce st. Diploma.
- 3 Extension Sofas. N. McGraw, 478 Pearl st. Diploma. Medal last year.
- Surgical Instruments. Miller & Oberlander, 98 Fulton st. Diploma.
- 3 Hats. John McManus, Albany. Diploma.
- Brass Speaking-Trumpet. G. Stump. Diploma.
- 6 Army and Navy Chapeaux. E. Mullen, corner Hester and Bowery. Diploma.
- 3 Otter Caps. A. M. & E. T. Ryder, 236 Water st. Silver Medal.
- India-Rubber Goods. Hodgman & Robinson, 42 Nassau st. Diploma.
- Civil Engineer's Level. Kyran Costigan, corner Beekman and Water sts. Diploma.
- Artificial Flowers. H. Martin & Co. 427 Broadway. Diploma.
- Cloth and Velvet Caps. G. W. Myer, 72½ Bowery. Silver Medal.
- Sign. F. M. Lane, 4 Broad st. Privileges.
- 2 Imitation Table-tops. G. Palmer, 86 Fulton st. Diploma.
- Best Cooking Stoves. J. L. Mott, 264 Water st. Silver Medal and Diploma.
- Rugs and Carpets. L. W. Miller, 48 Canal st. Diploma for best carp.
- Drawing-Knives and Chisels. A. R. Moen, 222 Pearl st. Diploma.
- Rugs. R. L. Smith, 448 Pearl st. Diploma.
- Model of Club Boat. W. G. McKay, 156 Pearl st. Privileges.
- Miniature Battle-ship, 74 guns. J. Crolus, 45 Beekman st. Diploma.
- Case of Shells. C. Trappan, 74 Chambers st. Diploma.
- Traveling Trunk. George Crouch, 29 Fulton st. Silver Medal.
- Wax Flowers. Mrs. E. Weatherhead, 34 Beekman st. Diploma.
- Small Bureau. J. Reeves, 54 Beekman st. Privileges.
- Model of Machine for Reaping. J. & E. C. Reed, 3 Broadway. Diploma.
- Dressing Case. D. H. Brown, 464 Broadway. Privileges.
- Design for Curtain Calico. F. Carter, 176 Fourth st. Diploma.
- Case of Ladies' Boots and Shoes. B. Shaw, 71 Canal st. Silver Medal.

- Case of Cakes. John McKenzie, 22 Orange st. Diploma.
- Brass Butts and Hinges. Scovills & Buckingham, Waterbury, Conn. Diploma.
- Best Specimens of Penmanship. M. A. Root, Philadelphia. Diploma.
- Case Dentical Preparations. C. S. Rowell, 23 Chambers st. Diploma.
- Military Clothing and Embroidery. J. Smith, 168 Pearl st. Diploma.
- Book-binding. Taylor & Young, 7½ Ann st. Diploma.
- Silver Ware. E. Stebbins & Co. 264 Broadway. Silver Medal.
- Quilt. Mrs. E. Jenks, 118 Second st. Diploma.
- Dale's Platform Scales. Deposited by Theodore Walsh, 114 Front st. Diploma.
- Model of Club Boat. James C. Kent, 17 Cortland st. Privileges.
- Belting. John Boyd, 186 Ludlow st. Diploma.
- Glass-cutting. N. Stouvenel, 49 Frankfort st. Diploma.
- Model of a Manger-Stopper. J. C. Wilson, Brooklyn. Diploma.
- Hose Cart, No. 16. Diploma.
- Valise and Folding Trunk. Joseph Carlisle, 2 Cortland st. Diploma.
- Painting. W. Ranny, corner of Bowery and Broome st. Diploma.
- Perfumery. Johnson & Co. corner Cedar and William sts. Diploma.
- Case of Brushes. Cross, Moss & Co. Lansingburgh. Diploma.
- Large Organ. Geo. Jardine, cor. Broadway and Grand st. Diploma.
- Cutting Glass. J. C. Bradley, cor. Grand and Elizabeth sts. Diploma.
- Glass Ware. Brooklyn Glass Co. Silver Medal and Diploma.
- Ladies' Toilet Cushion. James Lloyd, 206 Cherry st. Diploma.
- Model of an Inclined-plane Power Press. E. S. Scripture. Diploma.
- Wood Engraving. Joseph W. Morse, 17 Ann st. corner Theatre Alley. Silver Medal.
- Wire-work and Bird-cages. Stoutenburgh & Morrell, 3 Burling slip. Diploma.
- Seal Impressions. Edward Hulseman, 80 Nassau st. Silver Medal.
- Wax Portrait of M. M. Noah. M. Morrison, 189 Broadway. Diploma.
- Best Wax Calf-Skins. W. Kumbel, 33 Ferry st. Silver Medal.
- Ottomans and Chairs. Meeks & Stewart, 459 Broadway. Diploma.
- Engine No. 44. Silver Medal.
- Refrigerator. G. W. & H. Jennison, 300½ Broadway. Diploma.
- Copperplate Press. Robert Hoe & Co. 31 Gold st. Diploma.
- Miniature Painting. Wm. H. Miller, 167 Broadway. Diploma.
- Silver Spoons, Forks and Ladles. Eagles & Martin, Little Green st. Diploma.
- Britannia Ware. Leonard, Reed & Barton, Taunton, Ms. Diploma.
- Silver Pitchers. Mr. Forbes. Diploma.
- Set Silver Ware. J. W. Moore. Diploma.
- Silver Miniature Locket. C. Shaw, 41 Oliver st. Privileges.
- Extension Table. John D. Cordes, 41 Sullivan st. Diploma.
- Silver Vase. J. Thompson, Broadway. Silver Medal.
- Girandoles. J. Mitchell, Broadway. Silver Medal.
- Feather Brushes and Satchels. Steel & Mode, 305 Pearl st. Diploma.
- Wig and Piece. E. Souhard, 80 Nassau st. Diploma.
- Set Ivory-handle Knives and Forks. A. G. Hunter, Newark, N. J. Silver Medal and Diploma.
- 2 Fire-Engines, (Village.) D. L. Farnham, 247 Water st. Diploma.

Tenoning Machine. S. S. Parker, 170 Greenwich st. Diploma.
 Miniature Sleigh. James Acheson, 11 Avenue 2d. Privileges.
 Parent Indian Bow-spring. T. Shriver, Cumberland, Md. Diploma.
 Sign. D. N. Dubois, 520 Greenwich st. Diploma.
 Knit Cap. Mrs. Sherer, 67 North Moore st. Diploma.
 2 Ottomans. By an apprentice of W. & H. Cooke, Broadway. Priv.
 Fanning Ploughs, &c. T. C. & J. Moore, 83 Barclay st. Diploma.
 Marble Painting. John Johnson. Privileges.
 Oak Barrel. John F. Reed, 142 Broad st. Privileges.
 Model of House. Jasper F. Cropsey, 3 Spring st. Privileges.
 2 pieces of Oil-cloth. E. G. Woolsey, Newburgh. Silver Medal and Diploma.
 Specimens of Castings. S. B. Alger, South Boston Co. Diploma.
 Rotary Ploughs. Burnham & Scovill, 74½ Maiden Lane. Silver Medal and Diploma.
 Lathe. J. R. Hoole, 177 William st. Silver Medal.
 Parlor Organ. John Mead, Albany. Diploma.
 Exhibition of Dahlias. G. C. Thorburn. Diploma.
 2 Lamp Posts. Wm. Alexander, 98 Grand st. Diploma.
 Plough. E. G. Whiting, Wisconsin Territory. Diploma.
 4 Axes. Collins & Co. 10 Platt st. Silver Medal and Diploma.
 Large Stove for Hotels. J. G. Hathaway. Diploma.
 Beet and Turnip Drill. J. J. Weekes, Oyster Bay, L. I. Diploma.
 Corn-Sheller. E. Dennison & Co. Saybrook, Conn. Silver Medal and Diploma.
 Rosewood Chairs. W. B. Shipman, 344 Broadway. Diploma.
 Saddler's Stitching Horse. S. Hebard, 241 Cherry st. Diploma.
 Rifle and Shot-gun combined. Samuel Adams, Troy. Diploma.
 Revolving Pistols. A. W. Spies, 192 Pearl st. Diploma to Manufact.
 Model of a Saw-Mill. Pearson Crosby, Fredonia, N. Y. Diploma.
 Spring Cart. F. M. Ray, Catskill. Diploma.
 Steam-Engine. Dunham & Co. Diploma to maker.

DESCRIPTION OF AMERICAN PATENTS

Granted from June 10th to June 12th, 1840.*

Improvement in the Electro-Magnetic Telegraph. By CHARLES WHEATSTONE and WILLIAM F. COOKE, Great Britain. Date of English patent, June 12th, 1837: patented in the United States, June 10th, 1840.

CLAIM.—1. In the improvement hereinbefore described, for the purpose of communicating determinate angular motions to magnetic needles by means of electric currents transmitted through metallic circuits, and the adaptation of such angular motions for the purpose of signals in distant places. And whereas some experiments have been heretofore made by others, upon giving signals by means of the well-known

* The interval between May 26th and June 10th, during which, it will be observed, no patents were issued, was occupied in removing the Patent Office into the new and commodious building erected for its use.

instruments called galvanometers, which are for measuring the force of electric currents passing through metallic circuits, we wish it to be understood that we make no claim to the application of the multiplying coils of conducting wires, hereinbefore described, around the magnetic needles, but the improvement we have made in the adaptation of magnetic needles to the purpose of giving signals, is in disposing the needles in vertical planes, (the axes whereon they are fixed being horizontal) and in making the needles heavier at one end than the other, in order to give them a decided preponderance or tendency to hang perpendicular and point upwards, when they are not influenced by electric currents, and in limiting the angular motions of the needles, (when they are so influenced) to some certain determinate extent by providing fixed stops against which the needles may recline, and continue at rest for a time, in suitable inclining directions for pointing out on a vertical dial the significations of the signals they are to give; and in case two or more such loaded needles are to be placed near together, in the same vertical plane, for pointing out signals on the same dial, then in the adaptation of astatic needles, (that is, two reversed needles fixed on the same horizontal axis) for giving signals in such cases. But note, the astatic mode of combining magnetic needles for galvanometers being well known, we make no claim to the use of astatic needles for giving signals, unless such astatic needles are, as before mentioned, disposed two or more in a vertical plane, and are loaded at one end, and have their angular motion limited to a determinate extent by stops.

2. In the improvement hereinbefore described, of combining several magnetic needles, so that they will point out on one dial (suitably marked) the significations of the signals which they are to give by the determinate angular motions which are communicated to them by electric currents. Those signals being given in some cases by the inclination and pointing of one needle; in other cases, by the concurrence and mutual pointing of any two needles, or in some cases by the concurrence of three or four needles, as may be most suitable for the sort of signals which are intended to be given.

3. In the improvement hereinbefore described, of arranging and combining any suitable number of conducting or telegraphic wires into a set, capable of being operated upon by buttons or finger-keys, at each end of the set, and having a voltaic battery, and also a dial with magnetic needles, as aforesaid, at each end of the set; with power of using those parts in such manner that at the pleasure of the operator any two or more such wires may have one or other of their ends connected to the two opposite poles of the battery belonging to that end, the contrary ends to those ends which are so connected being at the same time conjoined together so as to form the said two or more wires into a metallic circuit or circuits, for the transmission of an electric current or currents throughout the length of two conjoined wires, as a means of giving signals, by the angular motions that such current or currents will communicate to magnetic needles, which are subjected by the influence of such currents or of sounding alarms, by the conjoined action of magnetic needles aforesaid, or of the evolution of gas from decomposition of water by such currents, and of occasional or temporary magnetism excited in masses of soft iron by such currents. And whereas either

end of any wire or wires, of such set as aforesaid, is capable of being connected with either pole of its appropriate battery, a diversity of metallic circuits can be formed, with a capability of transmitting an electric current in either direction through each such circuit, and of thereby giving a diversity of signals from a few wires.

4. In the improvement, hereinbefore described, in the arrangement and combination of each set of buttons and finger-keys, the ends of all the several conducting wires constituting the set thereof, are kept conjoined one to another, in readiness for becoming parts of any such circuits as may be formed by connecting the opposite or distant ends of the wires with the distant battery; but, nevertheless, the several buttons and keys hold all the several ends which belong to them, in due order for enabling the operator to disjoin any two or more ends from their fellow ends, by an instantaneous touch, which likewise connects the ends so disjointed with either pole of the battery belonging to the keys, and *vice versa*; the same self-action of the keys whereby they disconnect the said ends from those poles when the buttons are released, likewise rejoins those ends to their fellow ends in the set.

5. In the improvement hereinbefore described, whereby a set of combined conducting wires, as aforesaid, having a voltaic battery and a set of buttons or finger-keys, and also a dial with magnetic needles, for giving signals, as well as an apparatus for sounding alarums, at each end of the set, may also have duplicates of such dials with needles, and apparatus for alarums at intermediate places between the two ends of all such duplicates, or operating simultaneously with each other, and with the two end dials and alarums, to give like signals and to sound like alarums.

6. In the improvement hereinbefore described, and represented at figure Y, sheet II, of the drawings hereunto annexed, for communicating determinate angular motions to magnetic needles, by subjecting them to the attractive forces of occasional or temporary magnetism, which is excited in soft iron by means of electric currents, for the purpose of giving signals in distant places by such determinate angular motions of needles.

7. In the improvement hereinbefore described, and represented at figure R, sheet II, of the drawings hereunto annexed, for sounding alarums in distant places, either by direct application of the attractive force of occasional or temporary magnetism, which is excited in soft iron by means of electric currents transmitted through metallic circuits, or else by applying the said attractive force of such occasional magnetism to let off ordinary clockwork alarums, and permit them to sound by the mechanical force and action of their own mechanism.

8. In the improvement hereinbefore described, and represented at figure S, sheet II, of the drawings hereunto annexed, for sounding alarums in distant places by the aid of an additional voltaic battery (or alarum battery) which is brought into action when required for sounding the alarum, the sounding thereof being either by direct application of the attractive force of occasional magnetism, or by applying such force to let off clockwork alarums as above (7thly) stated; but according to this, our 8th improvement, the requisite magnetism is excited by an electric current derived from that additional battery, the metallic circuit

by which that current is so derived from the said battery, being formed (when the same is required to act) by an angular motion then communicated to a magnetic needle, which is disposed within multiplying of conducting wire, through which an electric current is transmitted from a distance, the said angular motion of the needle being caused to make the requisite contacts for forming the metallic circuit of the additional or alarum battery.

9. In the improvement hereinbefore described, and represented in figure Q, sheet II, of the drawings hereunto annexed, for effecting the contact requisite for forming a metallic circuit, by which an additional or alarum battery is brought into action, for the purpose of sounding alarums in distant places, as above (Sthly) set forth; but which contact in this our 9th improvement is effected by means of the evolution of gas arising from the decomposition of water, which is included within a small, close vessel, from which the gas cannot easily escape, wherefore it presses down on the water, and thereby raises up a small column of mercury from the bottom of the vessel into the open leg of an inverted syphon tube, which is connected with the vessel so as to raise the mercury up into contact with the end of a wire, in order to form the required circuit.

Improvement in the Machine for Cutting Corks. By SAMUEL SAWYER, Boston. June 10th.

CLAIM.—1. I claim rounding or forming the cork by means of the revolving circular knife, in combination with a moveable feeding frame, operated by means of the arm YY and roller Z, working with the eccentric groove or camwork *a a a*, arranged on the shaft FF; the whole constructed and operating substantially in the manner and on the principles above described.

2. I claim sharpening the revolving knife, *while in operation*, by means of a revolving whetstone, operated as above described.

3. I claim revolving *both holders*, by means of the system of bands and pulleys above described, thereby effectually preventing the liability to twist the cork while in the process of formation.

4. I claim the combination of the inclined planes, bent rod *ee*, fork *h*, and spiral spring *ff*, operating together as above described, to withdraw the holder W, for the purpose above set forth.

5. I claim the combination of the moveable inclined plane or latch *b²*, and catch *d²*, with the bent lever *y' y'*, operating with the pulleys W *r*, wheel *v*, and spring *x*, on the axis *p p*, in the manner and for the purpose above described.

Improvement in Cooking Stoves. By WILLIAM GALLUP, Norwalk, Ohio. June 10th.

CLAIM.—Having thus fully described the construction, and the mode of using my stove, what I claim therein as of my invention, and desire to secure by letters patent, is the forming of a baking compartment H, by arranging the oven below the throat B of the furnace, in the manner described, instead of above it, as heretofore, by which means a radiating surface is presented at the back of the compartment.

Improvement in the Ever-Pointed Pencil. By THOMAS WOODWARD, Brooklyn, N. Y. June 10th.

CLAIM.—What I claim therein, and desire to secure by letters patent, is the forming of the spiral channel for protruding and retracting the pencil-holder within the sectional tube C, and combining this tube with the other parts of the case, under the particular arrangement set forth, so that the upper and lower portions shall remain stationary, whilst that marked C is made to revolve. I also claim the manner of locking the point by the combined operation of the straight and spiral slots, as set forth.

Improvement in the Spring-Bolt, for Door and other Locks. By G. W. and E. B. ROBINSON, Boston. June 10th.

CLAIM.—What we claim as our invention, and desire to secure by letters patent, is the bar of metal turning on a pivot in the spring-bolt, and provided with a spring in combination with the spring-bolt, for the purpose and in the manner described.

Improvement in Furnace Bakers. By GARDNER CHELSON, Boston. June 10th.

CLAIM.—I claim the combination of the elongated hot-air chamber E E, (divided into three apartments, *g' h' i' k' l' m' n' o' p' q'* by two partitions, KK, LL, with sliding valves *o, p*, therein) with the elliptical or cylindrical furnace *c c*, and also the combination of the latter with the double-reflecting baker surrounding them; the whole being constructed and arranged substantially in the manner above set forth and described, for the purpose of retaining and circulating the heat throughout the apparatus, and causing it to accomplish the several operations above mentioned in a very effectual and expeditious manner, and with great economy of fuel.

Improvement on Drummond's Rotary Steam-Engine. By JAS. MOORE, Elizabethtown, N. J. June 10th.

CLAIM.—What I claim as my invention, and which I desire to secure by letters patent, consists in the arrangement of the circular spring plate inside the cylinder, for closing the joint between the plate forming said cylinder, to prevent the escape of the steam, in combination with the roller on the arm for contracting said plate, in order to allow the arm to pass round, as before described.

Improvement in the Horse Power for driving Machinery. By ENOCH PIPER, Camden, Me. June 10th.

CLAIM.—What I claim as my invention and improvement, is the mode of arranging and sustaining the floor-planks by attaching the middle of each to the belt midway between the axles of the trucks, and bringing their ends to bear on the axles, yet with liberty to rise from the axles in passing around the drums, as set forth in the foregoing description, and in any similar manner embracing analogous arrangements or principles of action.

Improvement in the mode of applying the Waste Heat of Blast Furnaces to Steam Boilers. By MARTIN BELL, Antis, Pa. June 10th.

CLAIM.—What I claim therein as constituting my invention and discovery, and which I desire to secure by letters patent, is the arrangement of flues and their necessary appendages as hereinbefore described, by which I connect a pair or pairs of boilers with a blast furnace, substantially in the manner set forth and described; thereby applying the flame and heat escaping out of the top of the furnace, to create a steam power which may be used to blow the furnace, and which may also be applied to other purposes.

And it is hereby declared that I do not intend or purpose to limit myself to the number of boilers, or to the precise form of the respective parts as described and delineated, but to vary these as I may think proper, whilst I attain the same end by means substantially the same.

Improvement in the mode of supporting Metal Roofs. By PETER NAYLOR, New-York. June 12th.

CLAIM.—What I claim as constituting my improvement, and desire to secure by letters patent, is the combining of iron truss beams, constructed in the manner herein described, with the plates constituting the metallic roofing, said truss beams being placed above the roofing, and sustaining the same upon the suspension principle, substantially as set forth.

Improvement in the Hill-side Plough. By DANIEL GOCHNOUR, Jun. Conemaugh township, Pa. June 12th.

CLAIM.—What I claim as my invention and constituting my improvement on the Teeter Plough, is the manner in which I have combined the mould-board with the land-side, instead of on a roller placed in the bar of the land-side at a distance from the point, as in the Teeter Plough, by means of which arrangement I am enabled to use the shares of the Teeter Plough alternately as a coulter and a share, thereby dispensing with the ordinary fixed coulter employed in said Teeter Plough.

I also claim, in combination therewith, the method of securing the mould-board to the alternate sides of the land-side, by means of the catch L, and rod N; the whole being constructed and arranged as herein set forth.

Improvement in the construction of the Mouth-piece of Mail Bags, &c. By JAMES SELLERS and ABRAHAM L. PENNOCK, Philadelphia, Pa. June 12th.

CLAIM.—What we claim as of our invention, and desire to secure by letters patent, is the making of such mouth-pieces so that they shall consist of three or more sides, and be so formed and arranged upon the principle and in the manner herein shown, that two or more of the sides, which must be inflexible, shall confine the remainder by a single fastening; the flexible portions, when used, being embraced and confined between other portions which are inflexible, in the manner herein shown.

LIST OF ENGLISH PATENTS

Granted between the 26th of March and 27th of April, 1840.

John Bethell, of St. John's Hill, Wandsworth, gent., for improvements in treating and preparing certain oils and fatty matters. March 28; six months to specify.

Claude Joseph Edmed Chaudron Junot, of Brewer-street, Golden square, operative chemist, for certain improved processes for purifying and also for solidifying tallows, grease, oils, and oleaginous substances. March 30; six months.

Henry Martin, of Morton Terrace, Camden Town, for improvements in preparing surfaces of paper. March 30; six months.

William Neale Clay, of Humby, gent., for improvements in the manufacture of iron. March 31; six months.

John Leberecht Steinhauser, of Upper Islington Terrace, gent., for improvements in spinning and doubling wool, cotton, silk, and other fibrous materials, being a communication from a foreigner residing abroad. March 31; six months.

Peter Bancroft, of Liverpool, merchant, and John Mac Innes, of the same place, manufacturing chemist, for an improved method of renovating or restoring animal charcoal after it has been used in certain processes or manufactures, to which charcoal is now generally applied, and thereby recovering the properties of such animal charcoal, and rendering it again fit for similar uses. March 31; six months.

Charles Cummins, of Leadenhall-st., chronometer maker, for certain improvements in barometers and sympiesometers. April 2; six months.

James Stead Crosland, of Leeds, engineer, for certain improvements applicable to locomotive and other steam-engines. April 2; six months.

Thomas Smedley, of Holywell, gentleman, for improvements in the manufacture of tubes, pipes, and cylinders. April 4; six months.

Harrison Blair, of Kearsley, manufacturing chemist, and Henry Hough Watson, of Little Bolton, chemist, for an improvement or improvements in the manufacture of sulphuric acid, crystallized soda, and soda ash, and the recovery of a residuum or residuums applicable to various useful purposes. April 6; six months.

Richard Beard, of Egremont-place, New-road, gent., for improvements in printing calicoes and other fabrics, being a communication from a foreigner residing abroad. April 6; six months.

Edward Thomas Bainbridge, of Park-place, Saint James, gent., for improvements in obtaining power. April 13; six months.

Thomas Young, of Queen-street, London, merchant, for improvements in lamps. April 13; six months.

James Caldwell, of Mill-place, Commercial-road, engineer, for improvements in cranes, windlasses, and capstans. April 15; six months.

John Gold, of Aetna Glass Works, Birmingham, glass manufacturer, for improvements in the manufacture of decanters and other articles of glass. April 15; six months.

William Potts, of Birmingham, brass founder, for certain apparatus for suspending pictures and curtains. April 15; six months.

Louis August de St. Sylvain, Baron de los Valles, of Nottingham-street, Marylebone, for certain improvements in cleansing, decorticating, purifying and preserving corn and other grain, being a communication from a foreigner residing abroad. April 15; six months.

William Grimman, of Camden-street, Islington, modeler, for a new mode of wood paving. April 15; six months.

Thomas Robinson Williams, of Cheapside, gentleman, for certain improvements in obtaining power from steam and other elastic vapors or fluids, and for the means employed in generating such vapors or fluids, and also for using these improvements in conjunction with distillation or evaporation, and other useful purposes. April 15; six months.

Joseph Whitworth, of Manchester, engineer, for certain improvements in machinery, or apparatus for cleaning and repairing roads or ways, and which machinery is also applicable to other purposes. April 15; six months.

William Unsworth, of Derby, silk-lace manufacturer, for an improved tag for laces. April 15; six months.

William Henry Bailey Webster, of Ipswich, surgeon, for improvements in preparing skins and other animal matters for the purposes of tanning and the manufacture of gelatine. April 16; six months.

Samuel Marlow Banks, of Bilston, gent., for improvements in the manufacture of iron. April 15; six months.

Samuel Wilkes, of Darlestone, iron founder, for improvements in the manufacture of vices. April 16; six months.

Robert Cooper, of Petworth, Gloucester, gent., for improvements in ploughs. April 16; six months.

Francis Molineux, of Walbrook Buildings, for improvements in the manufacture of candles, and in the means of consuming tallow and other substances for the purposes of light. April 23; six months.

Elijah Galloway, of Manchester-street, Gray's Inn Road, engineer, for improvements in steam-engines, which are also applicable to engines for raising and forcing fluids. April 23; six months.

Jonathan Sparke, of Langley Mills, Northumberland, agent, for certain improved processes or operations for smelting lead ores. April 23; six months.

John White, of Manchester, engineer, for certain improvements in vices. April 23; six months.

James Malcolm Rymer, of Henrietta-street, Bloomsbury, civil engineer, for certain improvements in castors for furniture, such improved castors being applicable to other purposes. April 23; six months.

LIST OF PATENTS

Granted for Scotland, between 22d of March and 23d of April, 1840.

Sir William Burnett, of Somerset House, for improvements in preserving animal, vegetable, woollen and other fibrous substances from decay. Sealed 25th March; four months to specify.

Peter Lomax, of Little Bolton, weaver, for certain improvements in looms for weaving. March 26.

Peter Bancroft, of Liverpool, merchant, and John Mac Innes of the same place, manufacturing chemist, for an improved method of renovating or restoring animal charcoal, after it has been used in certain processes or manufactures to which charcoal is now generally applied, and thereby recovering the properties of such animal charcoal, and rendering it again fit for similar uses. April 6.

William Hunt, of the Portugal Hotel, Fleet-street, London, manufacturing chemist, for improvements in the manufacture of potash and soda, and their carbonates. April 11.

Thomas Robinson Williams, of Cheapside, London, gent., for certain improvements in the manufacture of woollen and other fabric or fabrics of which wool or fur form a principal component part, and in the machinery employed for effecting that object. April 11.

Henry Philip Rouquette, of Norfolk-street, Strand, merchant, being a communication from abroad, for a new pigment. April 18.

William Stone, of Winsley, county of Wilts, gent., for improvements in the manufacture of wine. April 20.

Pierre Auguste Ducote, of No. 70 Saint Martin's Lane, lithographer, for certain improvements in printing china, porcelain, earthenware, and other like wares; and for printing on paper, calicoes, silks, woollens, oil-cloths, leather, and other fabrics; and for an improved material to be used in printing. April 20.

John Inkson, of Ryder-street, St. James's, gent., being a communication from abroad, for improvements in apparatus for consuming gas, for the purposes of light. April 20.

Jean François Victor Fabien, of King William-street, London, gent., being a communication from abroad, for improvements in rotary engines, to be worked by steam or other fluid. April 20.

Matthew Uzielli, of King William-street, city of London, merchant, being a communication from abroad, for certain improvements in the arrangement and construction of ships' hearths, or apparatus for cooking, and for obtaining distilled or pure water from salt or impure water. April 22.

Thomas Aitken, of Chadderton, in the county of Lancaster, manufacturer, for certain improvements in the machinery or apparatus for drawing cotton and other fibrous substances. April 22.

INDEX TO VOL. I.

Acacia,.....	294	Chemical powers of light,.....	289
Adhesiveness of timber,.....	217	Chilton on the effect of acid vapor on brass wire,.....	187
Aërial sailing,.....	213	Chinese collection, Philadelphia,..	416
Agricultural geology,.....	99	Civil engineering,.....	307
Alleged important discovery,.....	224	Clark's process of making white lead,	197
Alpaca wool,.....	282	Climate of South Australia,.....	150
Alverson's patent spiral spring draft for railroad cars,.....	266	Cloth-making without spinning or weaving,.....	56
American patents— descriptions of,..70, 312, 384, 472 lists of,.....67, 69, 160, 239,	311	Coinage,.....	218
Analysis of soils,.....	251	Colored salt,.....	153
Ancient inks,.....	299	Compressed peat fuel,.....	465
Anderson's boiler,.....	453	Conversational meetings, Mechanics' Institute,.....22, 23, 29, 95,	261
Annals,.....	225	Copying medals, &c. by galvanism, 201, 278, 349,	434
Anthrax steam vessel,.....	135	Cultivation of the sunflower,.....	286
Anti dry-rot process,.....	463	Curious discovery,.....	459
Antique artillery,.....	283	Curious habits of the swan,.....	383
Antiquity of railways and gas,.....	142	Daguerreotype, improvement in the,	129
Antiquity of the pyramids,.....	150	“ rival to the,.....	132
Apprentices' library,.....	100	“ Wolcott's improve- ments on the,.....	193
Archimedes steamer,.....	138	Daguerreotype, anticipated results from the,.....	304
Area of cylinders, table of,.....	52	Daguerreotype, remarks on the,...	401
Artificial incubation,.....	296	Deluges and earthquakes in China,	223
Artists' fund society, Philadelphia,..	421	Description of patents, 70, 312, 384,	472
Art of floating,.....	291	Discovery of a canoe,.....	154
Art of illuminating revived,.....	283	Discovery of a subterranean chamber at Alton,.....	154
Art of printing,.....	303	Dissecting microscope,.....	217
Assay of gold,.....	300	Doctrine of colors,.....	213
Australia, peculiar characteristics of,	292	Doryanthes excelsa,.....	382
Barometer,.....	154	Draper on the daguerreotype,.....	401
Bees found in the trunk of a tree,..	381	Earthquakes,.....	152
Berzelius,.....	209	Eccaleobian,.....	296
Bezoar,.....	151	Eclipses of the sun and moon,.....	225
Birmingham railway,.....	143	Effect of acid vapors on brass wire,	187
Bread-making, experiments in,.....	459	“ light on color,.....	133
Bricks,.....	53	Effects of food on the form and cha- racter of quadrupeds,.....	383
British Queen, table of the average workings and consumption of coal,	50	Effects of lightning on ships,.....	284
Building, art of, 14, 106, 169, 243, 337,	412	Electro-magnetic telegraph of the Great Western Railway,.....	213
Calcination of copper ores, improved process,.....	300	Electro-magnetism,.....	297
Candles,.....	55	Engineer's and machinists of France,	215
Carbonic acid as a moving power,..	295		
Carnivorous plants,.....	381		
Cass's revolving harrow,.....	265		
Cast-iron, steel, &c.	288		

- Engine worked by compressed air, 216
 Engraving, ... 23
 Equivocal generation, ... 151
 Everett's improved ship-wrench, ... 355
 Experiments in bread-making, ... 459

 First paper made in England, ... 155
 First railroad in Holland, ... 142
 " " Italy, ... 142
 Foreign patents, lists of, ... 155, 157,
 226, 235, 238, 397, 478
 Franklin institute, Philadelphia, ... 346
 Frost on building, 14, 106, 169, 243, 337, 412
 Fuel for steam purposes, ... 308

 Galvanic electrotype and daguerreo-
 type, ... 458
 Gas for illumination, ... 371
 Gas for supplying heat, ... 372
 Gas produced by a new process, 286, 455
 Gas-pipes dispensed with, ... 53
 Gates for the crossing of railways, ... 214
 General Society of Mechanics and
 Tradesmen, ... 32, 101, 191, 258
 Geographical discovery, ... 153
 Geological reports, ... 4, 81, 328, 404
 Glasgow and Liverpool steam-ship
 Achilles, ... 61
 Glass weaving, ... 460
 Goode on the magneto-electric spark
 &c., ... 11
 Good husbandry, ... 458
 Great western steam-ship company, 225

 Hague's ever-pointed pencil, ... 192
 Harmoniphon, ... 293
 Hewitt's screw wrench, ... 37
 Historical statement of duty perform-
 ed by steam-engines in Cornwall, 205
 Horticulture, the wonders of, ... 292

 Ill effects of rapid variations of light
 on the eyes, ... 215
 Image on the retina, ... 212
 Importance of mechanical institutions 436
 Important discovery for preventing
 the oxidation of metals, ... 55
 Important discovery in the art of
 printing, ... 303
 Important discovery—neutralizing
 carbonic acid, ... 284
 Improved easy chair, ... 422
 " gas stove, ... 464
 " lamp for steam vessels, .. 59
 " railway guage, ... 18
 " safety lamp, ... 53
 Improvement in paddle wheels, ... 461
 " steam-engines, ... 134
 " the manufacture of
 iron, ... 305
 India-rubber boot-heel, ... 202
 " boat, ... 266
 Indicator of the level of water in
 boilers, ... 53, 267
 Ingenious invention, ... 58

 Intellectual resources of London.... 290
 Introduction, ... 1
 Invention of the thermometer, ... 291
 Inventor of the steam-indicator, ... 98
 Inverted image on the retina, ... 212
 Iron-built and timber-built ships, ... 441
 Iron ships, ... 263
 Iron steam-ship, ... 64

 Jupiter's fourth satellite, ... 214

 King's invention for preventing acci-
 dents on railways, ... 356

 Late earthquake, ... 154
 Lectures at the Mech. Inst. 178, 199, 268
 Leslie's coronation picture, ... 210
 Letter from Dr. Wallace, ... 439
 " Hon. Daniel Webster, 175
 Lightning conductors, ... 285
 Lists of Am. patents, 67, 69, 160, 239, 311
 Lists of foreign patents, ... 155, 157,
 226, 235, 238, 397, 478
 List of awards at the fifth annual fair
 of the Mechanics' Institute, ... 467
 Locomotive excavator, ... 142
 Lusus naturæ, ... 365
 Lyceum of Natural History, ... 42
 proceedings of, 177, 256, 343, 418

 Machine-drawing and its advantages, 241
 Machine for beating hemp, ... 57
 Magneto-electric spark and shock,
 and electro-magnetic rotations, ... 11
 Manufacture of white lead, ... 87, 161
 Marine steam-engine boiler, ... 59
 March of intellect, ... 307
 Material for lighting, ... 55
 Mechanical science, ... 276
 Mechanics' Institute, ... 34
 Mechanics' Institute, conversational
 meetings at, ... 22, 23, 29, 95, 261
 Mechanics' Institute, lectures at, 178,
 199, 268
 Mechanics' Institute—Reports of the
 Committee of Arts and Sciences,
 36, 37, 104, 188, 190, 192, 197, 265,
 354, 355, 356
 Mechanics' vade mecum, ... 335, 424
 Mesmes on the daguerreotype, ... 116
 Metallochromy, ... 214
 Misconception on railways, ... 144
 Mortar, ... 95
 Mott's cast-iron fronts and columns, 188

 National Academy of Design, ... 38, 184
 Transactions, ... 260, 357
 Review of the exhibition, 359, 431
 Neutralizing carbonic acid, ... 284
 New alloys of metals, ... 294
 New chemico-mechanical battery, .. 366
 New conservative power, ... 148
 New engine, ... 57
 New escapement, ... 460
 New life-boat, ... 463

New method of hydrographic surveying,.....	321	Spots on the sun,.....	153
New mode of marking linen,.....	294	Steam boiler explosions,.....	377
New mode of producing malleable iron direct from the ore,.....	221	Steam carriage for common roads,.....	134
New mode of resuscitation from drowning,.....	295	Steam-engine,.....	59
New musical instrument,.....	54	Steam-engine boiler—important,...	203
New source of light,.....	294	Steam-engine familiarly explained,.....	140
New steamboat Alice,.....	61	Steam-engine indicator,.....	46
New steam-ship New-York,.....	63	Steam fire-engine,.....	97
New theory of vision,.....	253	Steam locomotion,.....	58
Norris on hydrographic surveying,.....	321	Steam power in Birmingham,.....	134
Note on electro-magnetism,.....	297	Steam power in France,.....	135
Notices of fine arts,....114, 184, 359,	431	Steam-pressure indicator and safety-valve,.....	460
Notices of new publica. 66, 202, 308,	466	Steam-ship Achilles,.....	61
Novel steam apparatus,.....	141	Steam-ship New-York,.....	63
		Steam-ship President,.....	63
Oram's compressed fuel,.....176,	273	Steam-towing on canals,.....	137
Owl at sea,.....	153	Steam vessels,.....	60
Oxygen gas,.....	168	Steam vessels on the Atlantic in 1841,.....	204
		Steam whistle,.....	209
Pape's patent table-pianofortes,....	282	Stoves,.....	29
Paper,.....	54	Strength of the journals of shafts,....	276
Paper from the banana tree,.....	218	Structure of the earth's surface,....	287
Pearsall's row-lock,.....	36	Substitute for skates,.....	58
Peculiar characteristics of Australia,.....	292	Substitution of paper for metallic plates in the daguerreotype,.....	212
Petrifaction,.....	98	Surprising strength of an egg-shell,.....	254
Perkins's steam-gun,.....	439		
Pigeons,.....	151	Table for ascertaining the area of cylinders,.....	52
Plate glass,.....	222	Table of the average workings &c. of the British Queen,.....	50
Portable barometer,.....	58	Table of the diameters of first movers,.....	278
Position of mechanics in society,....	102	Table of the resistance of undensed steam,.....	51
Power of steam,.....137,	140	Table of strength of cast-iron beams,.....	424
Preservation of timber,.....	461	Table of weight of building materials,.....	335
Prevention of smoke and economy of fuel,.....	207	Table of wt. of lead per superfi. foot,.....	335
		Tar-making in Sweden,.....	464
Race between a deer and a steam-engine,.....	144	Thorwaldsen,.....	133
Railroads,.....	19	Thunder,.....	217
Railroad speed on the water,.....	57	Townsend's ice-breaker,.....	190
Railway carriages,.....	289	Transparent watch,.....	59
Railway speed,.....	142	Traveling times,.....	143
Railways tend to create traffic,....	144	Typoface,.....	133
Riddle's spiral ever-pointed pencil,.....	54		
Remarks on spectacles,.....	347	United States mint,.....	342
Remarks on the daguerreotype,....	401	United States patent office,.....	309
Rival to the daguerreotype,.....	132	Use of the barometer,.....	219
Robison on the best means of burning gas for supplying heat,.....	371	Use of the linden tree,.....	382
Robison on the best method of burning gas for illumination,.....	372	Use of the walnut tree,.....	459
		Uses of slate,.....	462
Salt water,.....	284		
Separation of lime from magnesia,.....	300	Wallace on a new theory of vision,.....	253
Serrell's machine for preventing &c. fires on board steam vessels,.....	104	“ on spectacles,.....	347
Shakspeare tunnel,.....	145	Weeks's canal tow-boat,.....	354
Simplan road surpassed,.....	145	West's new dissecting microscope,.....	217
Sir David Wilkie,.....	133	Whitelaw's water-mill,.....	283
Smee on the galvanic properties of the metallic elementary bodies, with a description of a new chemico-mechanical battery,.....	366	Wire-sewn boots and shoes,.....	53
		Wonders of steam,.....	140
		Wolcott's improvements in the daguerreotype,.....	193
		Wreck of the Royal George,...146,	456
		Zincotypography,.....	222

4/86

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